REPORT NUMBER: TO11-MGA-2003-005

FULL SCALE SIDE IMPACT POLE TESTS OF BASELINE VEHICLES
Task Order #T0007 / RFP #0011

SAAB AUTOMOBILE AB
2000 Saab / 9-5 / 4 Door
NHTSA NUMBER: RY0518

PREPARED BY:
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BURLINGTON, WI 53105

February 26, 2003

FINAL REPORT SUBMITTED: September 2, 2003

PREPARED FOR:
U.S. DEPARTMENT OF TRANSPORTATION
VOLPE NATIONAL TRANSPORTATION SYSTEM CENTER
55 BROADWAY, KENDALL SQUARE
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This final test report was prepared for the U.S. Department of Transportation, Volpe National Transportation System Center, in response to Contract Number DTRS57-98-D-00041.

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SECTION 1
PURPOSE AND TEST PROCEDURE

This Side Impact test is conducted as part of Contract No. DTRS57-98-D-00041, task order 11, sponsored by the U.S. Department of Transportation, Volpe National Transportation System Center. The purpose of this test is to evaluate the responses of the ES-2 and SID/HIII dummies in a 2000 Saab / 9-5 / 4 Door, when subjected to a rigid pole side impact at 285 degrees.

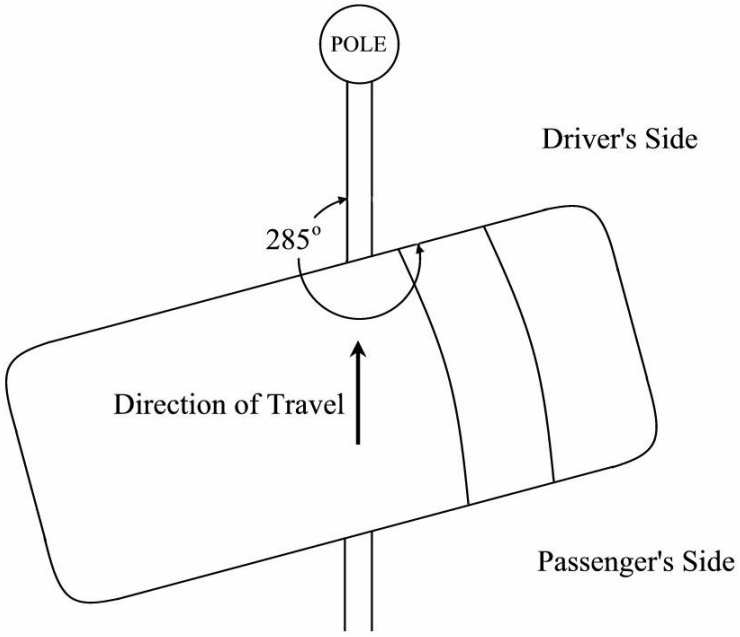
MGA does not endorse or certify products. The manufacturer's name appears solely for identification purposes.

SECTION 2
SUMMARY OF SIDE IMPACT TEST

A rigid pole side impact test at 285 degrees was performed on a 2000 Saab / 9-5 / 4 Door. The subject vehicle was towed into a rigid pole at a velocity of 32.3 km/h. The weight of the vehicle as tested was 1699.2 kg. The test was conducted at MGA Research Corporation in Burlington, Wisconsin, on February 26, 2003. Pre- and post-test photographs of the test vehicle and the dummies are included in Appendix A.

One ES-2 side impact dummy was placed in the left front designated seating position according to instructions specified in the NHTSA Office of Vehicle Safety Compliance Laboratory Test Procedure TP-214D-06, dated July 26, 2001. The side impact event was documented by ten high speed cameras. Camera locations and other pertinent camera information can be found in this report.

Appendix B contains the vehicle and dummy response data traces. A summary of the dummy configuration and performance verification test data is shown in Appendix C. Dummy and vehicle calibration data can be found in Appendix D of this report. Appendix E contains dummy peak responses.



SECTION 2…continued

SUMMARY OF SIDE IMPACT TEST

The following table summarizes the results of the Left Side Impact Test:

Head Performance Criteria		Left Front
<1000	T1 (msec)	40.8
	T2 (msec)	65.0
	HPC	171
Thorax Performance Criteria		
Chest Deflection <42 mm	Upper Rib Deflection	49
	Mid Rib Deflection	43
	Lower Rib Deflection	42
Viscous Criteria <1.0 (m/sec.)	Upper Rib	1.0
	Mid Rib	0.7
	Lower Rib	0.5
Abdominal Protection Criteria		
Sum < 2500 N	Front Abdominal Force	188
	Mid Abdominal Force	423
	Rear Abdominal Force	822
	Sum of Abdominal Force	1366
Pelvis Performance Criteria		
< 6000 N	Pubic Symphysis Force	1733

		Left Front
HIC	T1 (msec)	40.8
	T2 (msec)	65.0
	T2 – T1 (msec)	14.2
	HIC	171

Fir Filtered	Left Front
Upper Rib Y (g's)	114.6
Mid Rib Y (g's)	97.3
Lower Rib Y (g's)	79.3
Upper Spine Y (g's)	59.6
Lower Spine Y (g's)	48.9
Pelvis Y (g's)	57.3
TTI (g's)	82

Contacts	Left Front
Head (msec)	76.4
Arm (msec)	13.9
Rib (msec)	14.3
Pelvis (msec)	31.7

TEST NOTES

The dummy and vehicle X and Y velocities presented in this report do not contain the correct initial velocity. The correct initial velocities should be:

X – Test Speed * Sine 15 Degrees
Y – Test Speed * Cosine 15 Degrees

The following channels did not collect any valid data:

Driver Upper Spine Z Acceleration

Driver Left Femur Force X

The ES-2 dummy contained production rib extensions.

SECTION 3

ES-2 SIDE IMPACT DUMMY AND VEHICLE TEST DATA

DATA SHEET NO. 1

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

TEST VEHICLE INFORMATION

Make	Saab
Model	9-5
Body Style	4 Door
VIN	YS3EF48Z9Y3010107
Color	Painted Orange
Odometer Reading (mile)	41,869
Transmission	4 sp Automatic
Final Drive	Front
Number of Cylinders	6
Engine Displacement (L)	3.0
Engine Placement	Lateral

TEST VEHICLE OPTIONS

Front Airbag	Yes
Side Airbags	Seat side
Power Windows	Yes
Power Steering	Yes
Power Door	Yes
Tilt Wheel	Yes
Air Conditioning	Yes
Power Brakes	Yes
Anti-lock Brakes	Yes
AM/FM/CD	Yes
Cruise Control	Yes

DATA FROM CERTIFICATION LABEL

Manufactured By	Saab Automobile AB
Date of Manufacture	9/99

GVWR (kg)	2087
GAWR Front (kg)	1134
GAWR Rear (kg)	1048

DATA FROM TIRE PLACARD

Measured Parameter	Front	Rear
Maximum Tire Pressure (kPa)	273	273
Cold Pressure (kPa)	220	220
Recommended Tire Size	P215/55R16	P215/55R16
Tire Size on Vehicle	P215/55R16	P215/55R16
Tire Manufacturer	Michelin	Michelin

Measured Parameter	Front	Rear	Third	Total
Type of Seats	Bucket	Bench		
Number Of Occupants	2	3		5
Capacity Wt. (VCW) (kg)				417.3
Cargo Wt. (RCLW) (kg)				77.1

DATA SHEET NO. 1... (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

TEST VEHICLE WEIGHTS

	Units	As Delivered (UVW) (Axle)			As Tested (ATW) (Axle)		
		Front	Rear	Total	Front	Rear	Total
Left	kg	506.7	319.8		555.7	315.7	
Right	kg	498.5	308.4		518.0	309.8	
Ratio	%	61.5	38.5		63.2	36.8	
Totals	kg	1005.2	628.2	1633.4	1073.7	625.5	1699.2

TARGET TEST WEIGHT CALCULATION

Measured Parameter	Units	Value
Calculated Vehicle Target Weight (TVTW)	kg	1698.7

TEST VEHICLE ATTITUDES

	Unit	As Delivered	Fully Loaded	Ready for Test
Right Door Sill Angle	Deg	0.5 ND	0.1 ND	0.4 ND
Left Door Sill Angle	Deg	0.5 ND	0.1 ND	0.1 ND
Front Bumper Angle	Deg	0.1 RD	0.1 LD	0.0
Rear Bumper Angle	Deg	0.0	0.2 LD	0.1 LD

ND=Nose down, BD = Back Down, LD = Left Down, RD = Right Down

GENERAL TEST VEHICLE DATA

Measurement Description	Units	Value
Test Vehicle Wheel Base	mm	2702
Total Vehicle Length at Left Side	mm	3917
Total Vehicle Length at Centerline	mm	4844
Total Vehicle Length at Right Side	mm	3924
Total Vehicle Width	mm	1884
Weight of Ballast in Cargo Area	kg	0
Amount of Water in Fuel Tank	liters	0

TEST VEHICLE VERTICAL IMPACT LINE DATA

Measurement Description	Units	Value
Actual Impact Point	mm	17 Rear

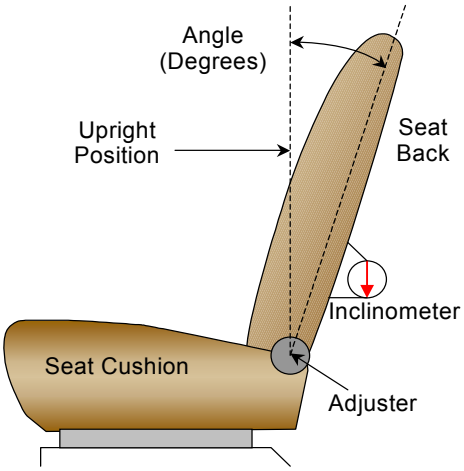
DATA SHEET NO. 1… (continued)

GENERAL TEST AND VEHICLE PARAMETER DATA

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

NORMAL DESIGN RIDING POSITION

Driver seat back angle: 2.8 degrees on headrest post



FRONT SEAT ASSEMBLY

SEAT FORE/AFT POSITIONS

The driver's seat is electronically operated.

The fore/aft is set to the middle position for the driver's seat.

Driver seat fore/aft total travel: 280 mm

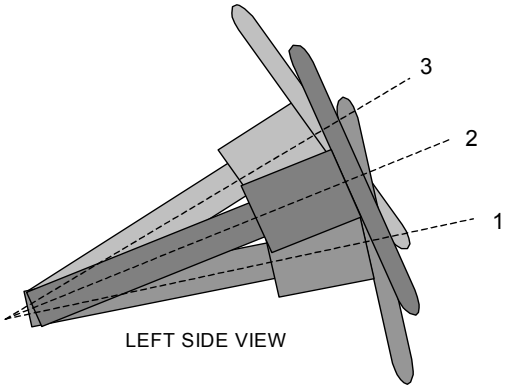
Driver seat fore/aft position: 140 mm

SEAT BELT UPPER ANCHORAGE

The test vehicle "D" ring anchorage for the driver's seat position was placed in the full up position.

STEERING COLUMN ADJUSTMENT

The column was placed in the mid position of travel.



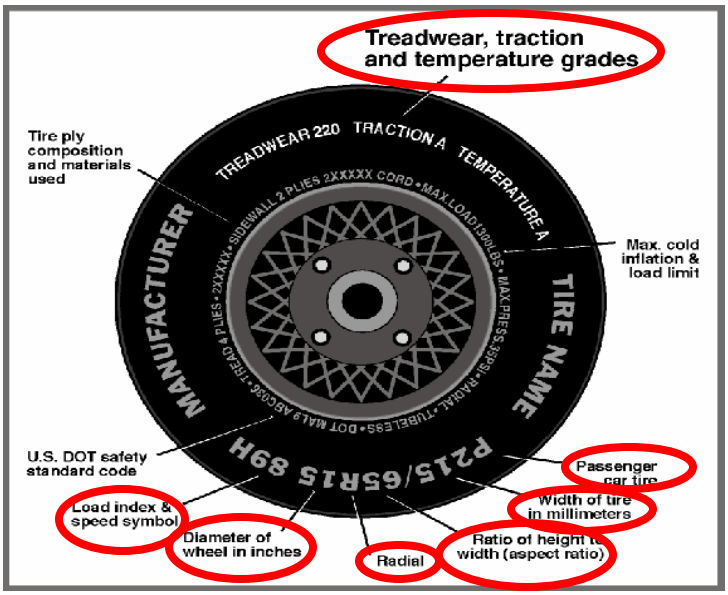
STEERING COLUMN ASSEMBLY

DATA SHEET NO. 2

TEST VEHICLE TIRE INFORMATION

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

Vehicle Year	2000	Vehicle Make	Saab
Vin	YS3EF48Z9Y3010107	Vehicle Model	9-5/ 4 Door



	Front	Rear
Tire Manufacturer	Michelin	Michelin
Tire Name	Energy MXV 4	Energy MXV 4
Tire Type	Passenger	Passenger
Tire Width (mm)	215	215
Ratio of Height to Width (aspect ratio)	55	55
Radial	Yes	Yes
Wheel Diameter	16	16
Load Index & Speed Symbol	93 V	93 V
Tread wear	340	340
Traction Grade	A	A
Temperature Grade	A	A

DATA SHEET NO. 3

POST TEST OBSERVATIONS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

TEST DUMMY INFORMATION AND CONTACT POINTS

Description	Left Front
Dummy Type	ES 2
Head Contact	Side airbag
Upper Torso Contact	Side airbag, door trim panel
Lower Torso Contact	Side airbag, door trim panel
Left Knee Contact	Door trim panel
Right Knee Contact	Left knee

POST TEST DOOR OPENING

Description	Left Front	Left Rear
Left Side Door Opening	Remained latched and closed	Remained latched and closed
Right Side Door Opening	Remained latched and closed	Remained latched and closed

POST TEST STRUCTURAL OBSERVATIONS

Critical Areas of Performance	Observations and Conclusions
Pillar Performance	None
Sill Separation	None
Windshield Damage	Left side shattered
Window Damage	Left side windows down for test
Other Notable Effects	None

AIRBAG DEPLOYMENT

	Driver
Front	Yes
Side	Yes
Curtain	None

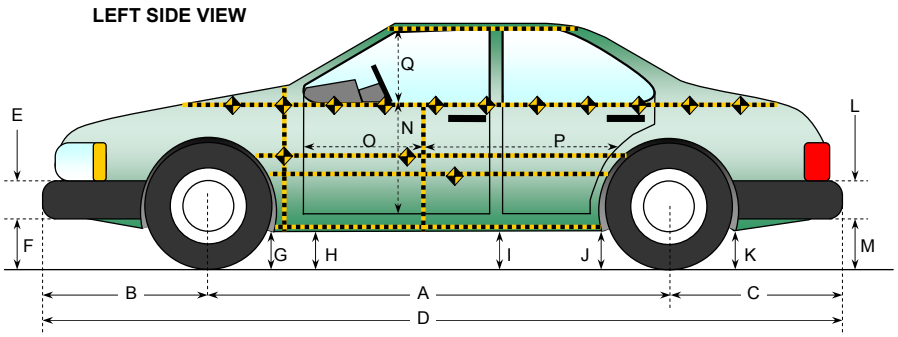
SECTION 4

OCCUPANT AND VEHICLE INFORMATION

DATA SHEET NO. 4

VEHICLE PRE-TEST AND POST-TEST MEASUREMENTS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003



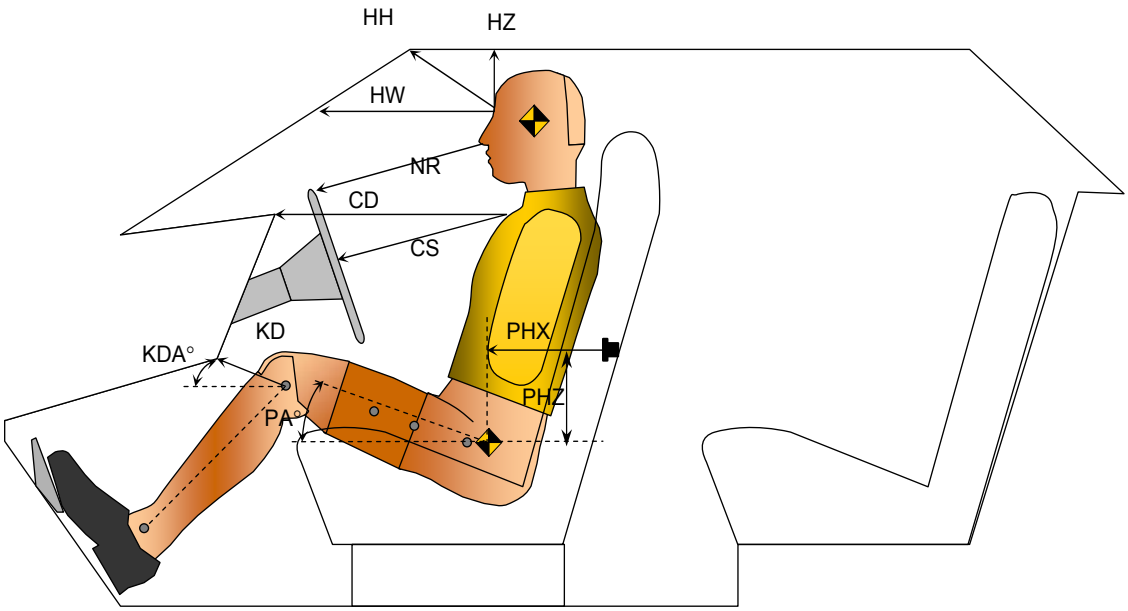
All Measurements in mm

Code	Measurement Description	Pre-Test	Post-Test	Difference
A	Wheelbase	2702	2523	179
B	Front Axle to FSOV	1044	1054	-10
C	Rear Axle to RSOV	1098	1149	-51
D	Total Length at Centerline	4844	4726	118
E	Front Bumper Thickness	210	210	0
F	Front Bumper Bottom to Ground	465	500	-35
G	Sill Height at Front Wheel Well	301	275	26
H	Sill Height at Front Door Leading Edge	321	298	23
I	Sill Height at "B" Pillar	331	311	20
J1	Sill Height at Rear Wheel Well	325	344	-19
J2	Pinch Weld Height at Rear Wheel Well	337	364	-27
K	Sill Height Aft of Rear Wheel Well	372	373	-1
L	Rear Bumper Thickness	251	251	0
M	Rear Bumper Bottom to Ground	472	438	34
N	Sill Height to Window Bottom Sill	683	673	10
O	Front Door Leading Edge to Impact CL	846	840	6
P	Rear Door Trailing Edge to Impact CL	1091	1048	43
Q	Front Window Opening	482	432	50
R	Right Side Length	3924	4012	-88
S	Left Side Length	3917	3735	182
T	Vehicle Width at "B" Post	1884	1430	454

DATA SHEET NO. 5

ES-2 LONGITUDINAL CLEARANCE DIMENSIONS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

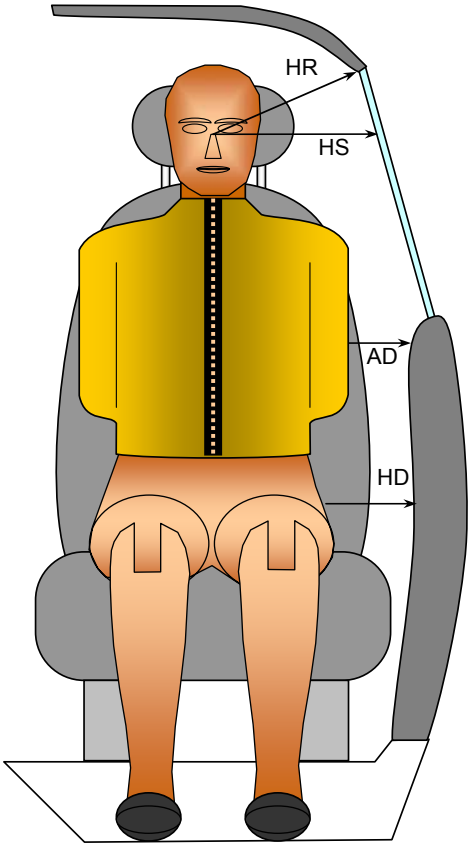


Driver Code	Measurement Description	Left Front	
		Length(mm)	Angle(°)
HH	Head to Header	452	
HW	Head to Windshield	639	
HZ	Head to Roof	165	
NR	Nose to Rim	509	
CD	Chest to Dash	577	
CS	Chest to Steering Wheel	381	
KDL	Left Knee to Dash	173	0
KDR	Right Knee to Dash	176	0
PA	Pelvic Angle (Longitudinal)		28.0
PA	Pelvic Angle (Lateral)		0.5
SA	Spine Angle (Longitudinal)		29.0
SA	Spine Angle (Lateral)		0.9
PHX	H-Point to Striker (X-Axis)	198	
PHZ	H-Point to Striker (Z-Axis)	92	

DATA SHEET NO. 6

ES-2 LATERAL CLEARANCE DIMENSIONS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003



FRONT VIEW OF DUMMY

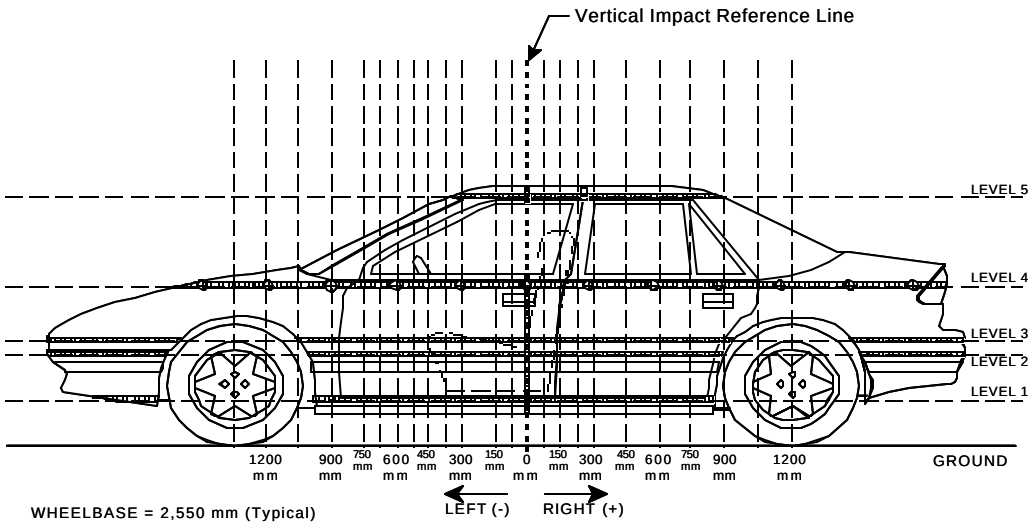
Code	Measurement Description	Units	Left Front
HR	Head to Side Header	mm	239
HS	Head to Side Window	mm	337
AD	Arm to Door	mm	110
HD	H-Point to Door	mm	167

DATA SHEET NO. 7

VEHICLE SIDE MEASUREMENTS

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

PRETEST AND POST TEST EXTERIOR PROFILE MEASUREMENTS



LEFT SIDE VIEW

Measurements are taken with vehicle in the as tested condition.
Measurements along the vertical 0 mm.
All measurements below in mm.

Level	Measurement Description	Height Above Ground
5	Window	1510
4	Window Sill	1040
3	Mid Door	755
2	Occupant H-Point	676
1	Sill Top	450

DATA SHEET NO. 8

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

	Pre-Test					Post-Test					Difference				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
-1950															
-1800															
-1650				310					309					-1	
-1500				290					287					-3	
-1350				276					272					-4	
-1200				267					259					-8	
-1050			211	260				213	254				2	-6	
-900		214	215	256			204	200	251			-10	-15	-5	
-825	243	216	214	255		246	228	220	251		3	12	6	-4	
-750	244	215	212	252		278	252	246	262		34	37	34	10	
-675	246	214	211	251		309	274	268	274		63	60	57	23	
-600	247	212	210	251		328	296	291	295		81	84	81	44	
-525	249	211	209	250		348	320	320	329		99	109	111	79	
-450	251	211	208	249		370	344	347	361		119	133	139	112	
-375	252	210	207	246		392	370	377	400		140	160	170	154	
-300	254	210	206	246		421	403	410	436		167	193	204	190	
-225	254	210	206	246		452	449	452	480		198	239	246	234	
-150	255	210	205	247	502	482	495	495	500	567	227	285	290	253	65
-75	256	209	205	247	496	527	537	533	561	600	271	328	328	314	104
0	257	209	205	248	490	566	577	578	601	630	309	368	373	353	140
75	258	209	205	249	496	585	600	609	629	672	327	391	404	380	179
150	259	209	205	249	493	572	601	603	624	664	313	392	398	375	171
225	259	210	205	250	493	532	562	562	592	632	273	352	357	342	139
300	259	211	206	252	493	472	487	493	563	599	213	276	287	311	106
375	259	212	207	254	493	414	432	440	530	568	155	220	233	276	75
450	258	212	209	257	496	364	387	403	506	575	106	175	194	249	79
525	257	212	209	259	495	310	348	369	480	563	53	136	160	221	68
600	256	213	210	261	495	269	317	341	446	555	13	104	131	185	60
750	254	214	212	267	500	226	261	291	391	539	-28	47	79	124	39
900	252	215	214	274	502	194	218	240	337	517	-58	3	26	63	15
1050		218	217	281	506		205	204	298	506		-13	-13	17	0
1200				290	517				272	513				-18	-4
1350				301					282					-19	
1500				312					310					-2	
1650				326					322					-4	
1800				340					347					7	
1950				357					357					0	
2100				376					370					-6	

Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body. Measurements in mm.

Note: The final impact point was located at + 80

DATA SHEET NO. 8… (continued)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

	Pre Test Level 6	Post Test Level 6	Difference at Level 6
-1950	1103	1130	27
-1800	1103	1140	37
-1650	1104	1149	45
-1500	1103	1160	57
-1350	1103	1170	67
-1200	1102	1179	77
-1050			
-975			
-900			
-825			
-750			
-675			
-600			
-525			
-450			
-375			
-300	1106	1243	137
-225	1106	1244	138
-150	1106	1246	140
-75	1105	1247	142
0	1104	1248	144
75	1103	1253	150
150	1103	1252	149
225	1103	1251	148
300	1103	1250	147
375	1104	1250	146
450	1104	1242	138
525	1105	1240	135
600	1105	1236	131
750	1105	1225	120
900	1106	1219	113
1050	1105	1207	102
1200	1104	1202	98
1350			
1500			
1650			
1800			
1950			
2100			

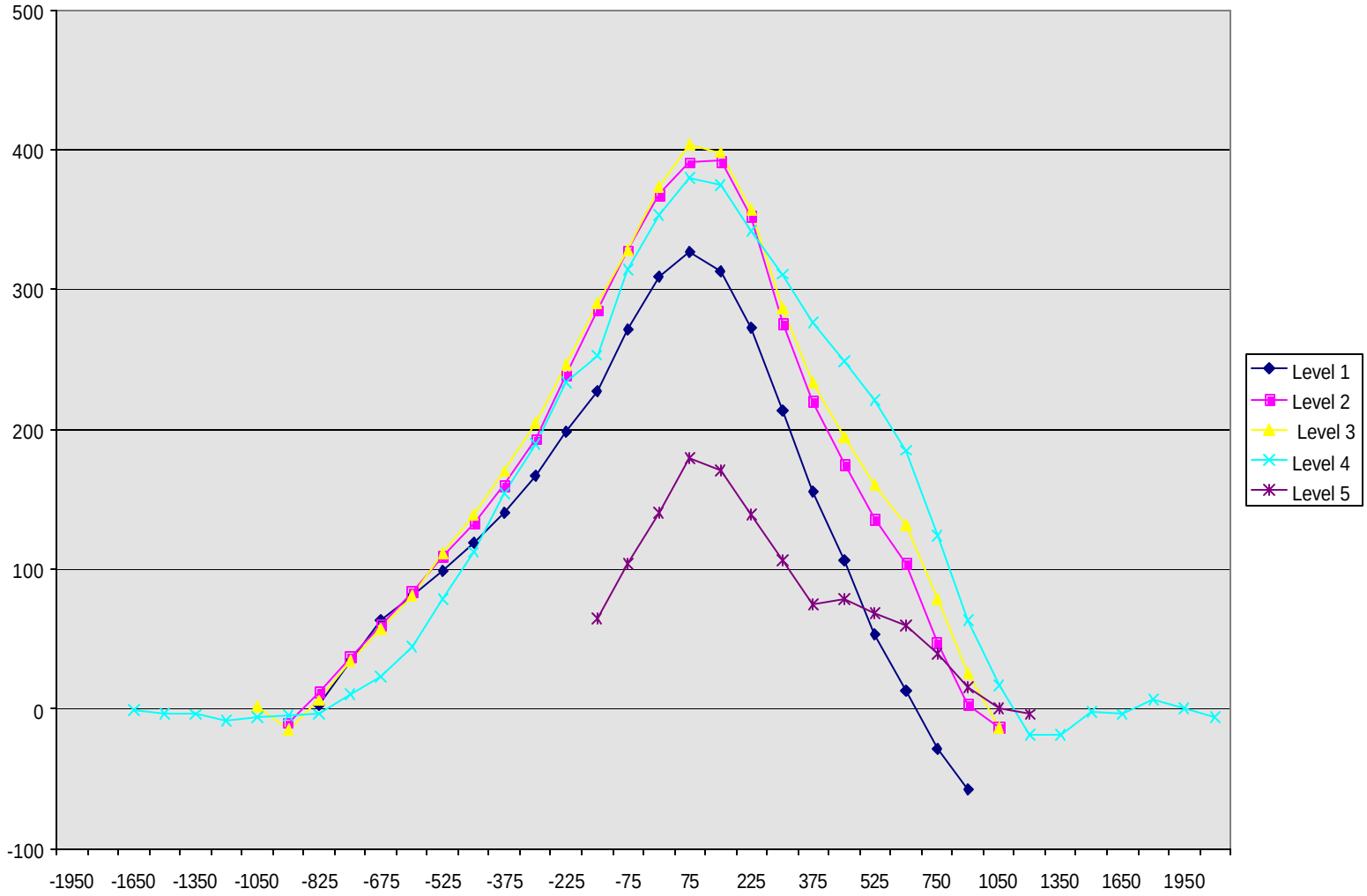
Reference plane is parallel to test vehicle longitudinal centerline.
Given dimensions = Reference plane to car body. Measurements in mm.

Note: The final impact point was located at + 80

DATA SHEET NO. 8... (continued)

VEHICLE EXTERIOR CRUSH PROFILES

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

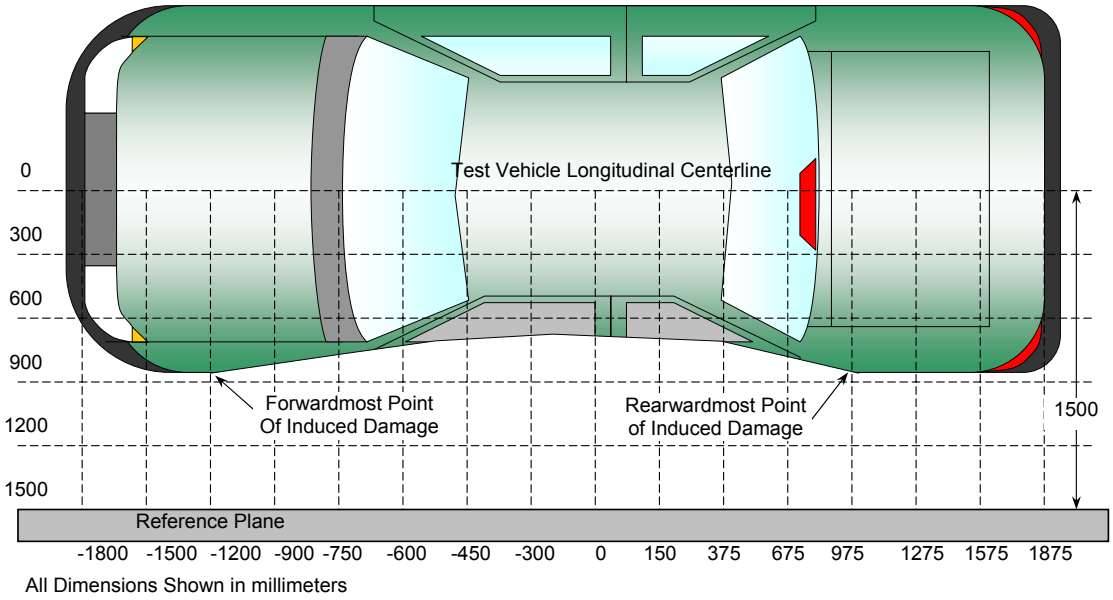


Measurement in mm.

DATA SHEET NO. 9

VEHICLE DAMAGE PROFILE DISTANCES

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003



TOP VIEW

Damage Profile Distances

DPD	Distance from Impact Point in mm	Level	Pre-Test (mm)	Post-Test (mm)	Max Static Crush (mm)
1	2250 mm	4	310	309	-1
2	1507 mm	4	256	248	-8
3	725 mm	4	247	516	269
4	-95 mm	4	266	396	130
5	-896 mm	4	312	308	-4
6	-1650 mm	4	404	399	-5

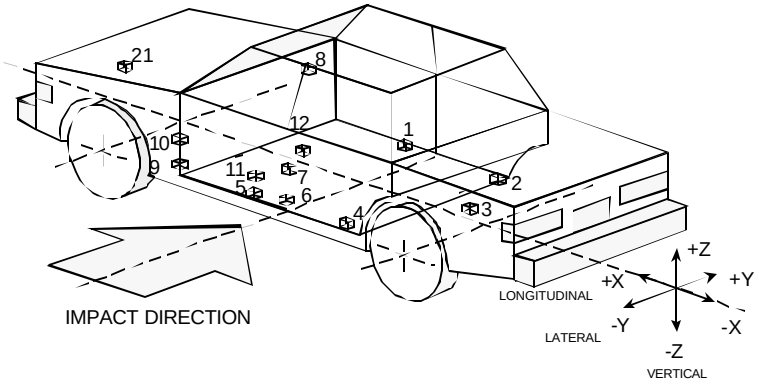
Reference plane is parallel to test vehicle longitudinal centerline.

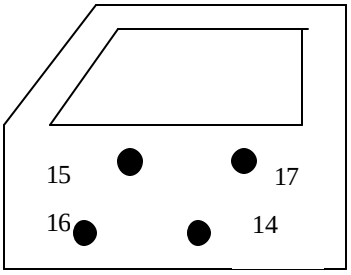
Given dimensions = Reference plane to car body.

DATA SHEET NO. 10

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003





No.	Location
1	Right Side Sill at Front Seat
2	Right Side Sill at Rear Seat
3	Rear Floorpan Above Axle
4	Left Side Sill at Rear Door
5	Left Side Sill at Front Door
6	Left Lower B-Post
7	Left Mid B-Post
8	Left Upper B-Post
9	Left Lower A-Post
10	Left Mid A-Post
11	Driver Seat Track

No.	Location
12	Vehicle CG
13	Left A-Pillar @ Roof
14	Left Front Door @ Pelvis
15	Left Front Door @ Arm
16	Left Front Door @ Knee
17	Left Front Door @ Rib
19	Left Driver Seat Frame
20	Right Driver Seat Frame
21	Lower Center Radiator Support

DATA SHEET NO. 10... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

VEHICLE ACCELEROMETER PEAK DATA AND PRE-TEST LOCATIONS

Loc. No.	Accelerometer Location	Long (X) Maximums (g's) (CFC 60)		Lat. (Y) Maximums (g's) (CFC 60)		Vert. (Z) Maximums (g's) (CFC 60)		Resultant (g's) (CFC 60)
		Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Max.
1	Right Side Sill at Front Seat	2.7	1.9	11.0	0.3	4.0	5.6	11.5
2	Right Side Sill at Rear Seat	3.0	1.2	14.0	0.6	3.8	2.8	14.0
3	Rear Floorpan Above Axle	2.6	1.8	13.3	1.3	5.9	4.6	13.9
4	Left Side Sill at Rear Door			29.6	2.8			
5	Left Side Sill at Front Door			30.5	0.2			
6	Left Lower B-Post			42.8	0.7			
7	Left Mid B-Post			45.7	5.2			
8	Left Upper B-Post			123.6	55.5			
9	Left Lower A-Post			15.7	0.2			
10	Left Mid A-Post			42.5	20.7			
11	Driver Left Seat Track			52.3	29.4			
12	Vehicle CG	3.2	2.7	21.4	1.4	7.6	7.0	21.6
13	Left A- Pillar @ Roof			38.3	3.1			
14	Left Front Door @ Pelvis			***	***			
15	Left Front Door @ Arm			***	***			
16	Left Front Door @ Knee			***	***			
17	Left Front Door @ Rib			***	***			
19	Left Driver Seat Frame **							
20	Right Driver Seat Frame **							
21	Lower Center Radiator Support	0.2	5.9	6.7	1.8	2.7	4.7	6.9

** = not used to avoid interference with airbags.
***= removed due to conflicts with the vehicle sensors in the door

Sign Convention X - (+ forward)
Y - (+ to right)
Z - (+ down)

DATA SHEET NO. 10... (continued)

VEHICLE ACCELEROMETER LOCATIONS AND DATA SUMMARY

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003

VEHICLE ACCELEROMETER COORDINATES

Loc. No.	Description	Coordinates (mm)		
		X	Y	Z
1	Right Side Sill at Front Seat	2492	675	227
2	Right Side Sill at Rear Seat	1872	675	244
3	Rear Floorpan Above Axle	1097	10	544
4	Left Side Sill at Rear Door	1488	-675	236
5	Left Side Sill at Front Door	2724	-675	219
6	Left Lower B-Post	2178	-657	332
7	Left Mid B-Post	2158	-548	758
8	Left Upper B-Post	2129	-516	1384
9	Left Lower A-Post	3267	-704	273
10	Left Mid A-Post	3317	-788	903
11	Driver Left Seat Track	2333	-549	339
12	Vehicle CG	2817	90	339
13	Left A-Pillar @ Roof	2707	-567	1275
14	Left Front Door @ Pelvis	**	**	**
15	Left Front Door @ Arm	**	**	**
16	Left Front Door @ Knee	**	**	**
17	Left Front Door @ Rib	**	**	**
19	Left Driver Seat Frame	*	*	*
20	Right Driver Seat Frame	*	*	*
21	Lower Center Radiator Support	4372	0	213

* = Not used to avoid interference with the restraint system

** = removed due to conflicts with the vehicle sensors in the door

Sign Convention X – Rear Bumper (+ forward)

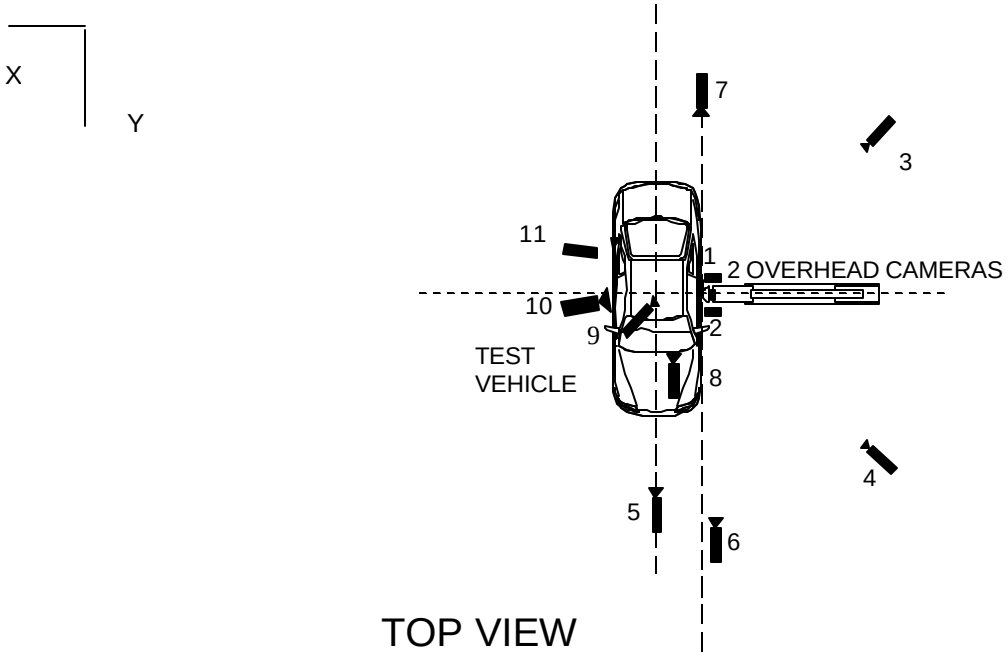
Y – Vehicle Centerline (+ to right)

Z – Ground Plane (+ up)

DATA SHEET NO. 11

HIGH SPEED CAMERA LOCATIONS AND DATA

Test Vehicle: 2000 Saab / 9-5 / 4 Door Test Date: February 26, 2003



TOP VIEW

No.	Camera View	Location (mm)			Lens (mm)	Film Speed (fps)
		X	Y	Z		
1	Overhead Overall	860	0	5000	8	1036
2	Overhead Close-up	0	0	5000	13	1020
3	Left Side 45 deg. Rearward Pole View	-2470	-5100	1420	50	1036
4	Left Side 45 deg. Forward Pole View	-2630	3580	1310	50	1026
5	Real Time					
6	Front Ground Level Vehicle/Pole Impact	4500	9000	1560	25	826
7	Rear Ground Level Vehicle/Pole Impact	70	-9370	1350	25	1047
8	Test Vehicle Onboard Driver Front View				13	526
9	Test Vehicle Onboard Driver Hip View				13	515
10	Test Vehicle Onboard Driver Side View				13	515
11	Test Vehicle Onboard Driver ¾ Rear View				13	521

Reference Points X - + Forward of Impact
Y - + Right of Impact
Z - + Up from Ground

APPENDIX A

PHOTOGRAPHS

TABLE OF PHOTOGRAPHS

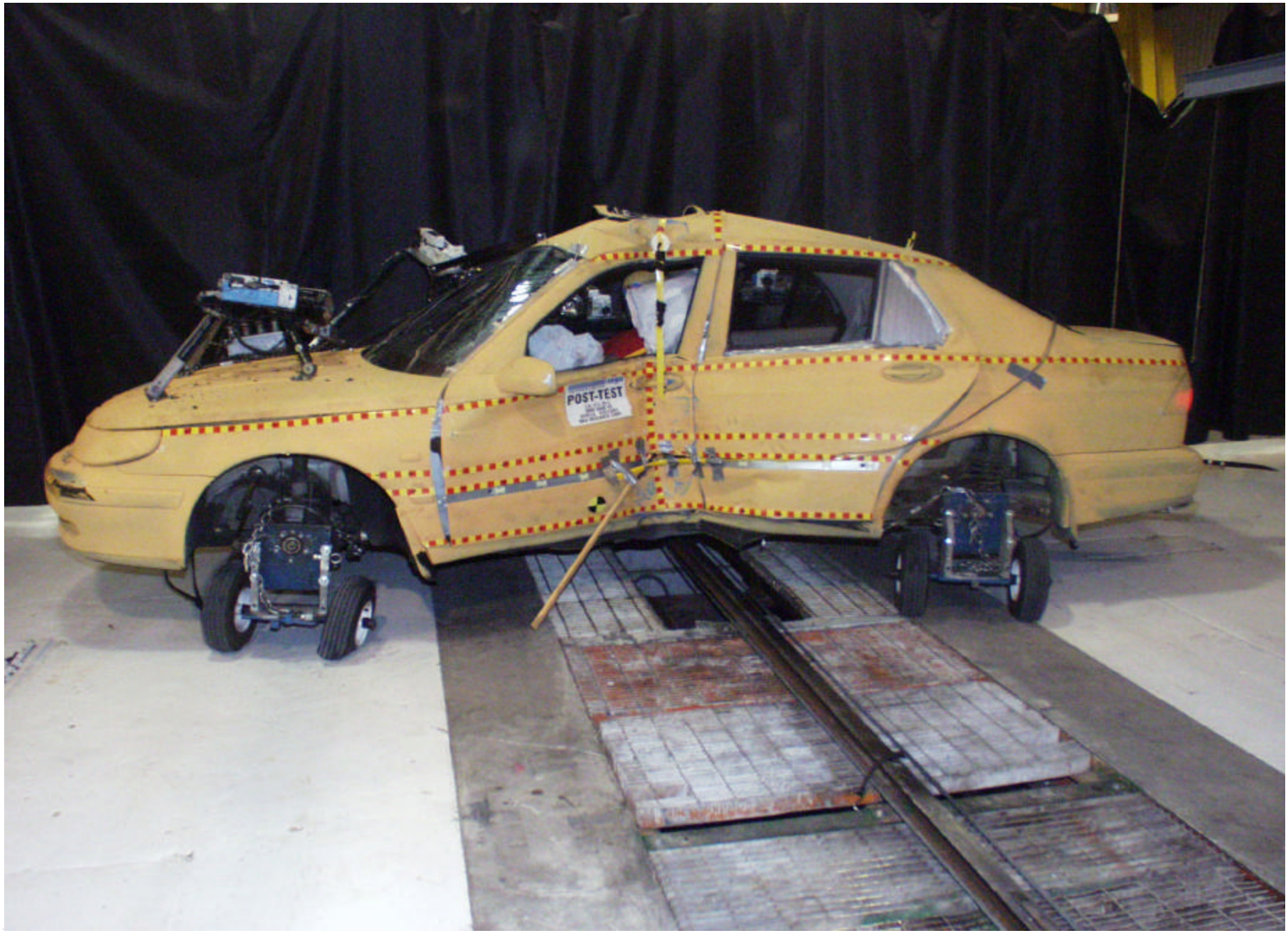
Pre-Test Front View of Test Vehicle

Post-Test Front View of Test Vehicle

Pre-Test Rear View of Test Vehicle

Post-Test Rear View of Test Vehicle

Pre-Test Left Side View of Test Vehicle



Post-Test Left Side View of Test Vehicle

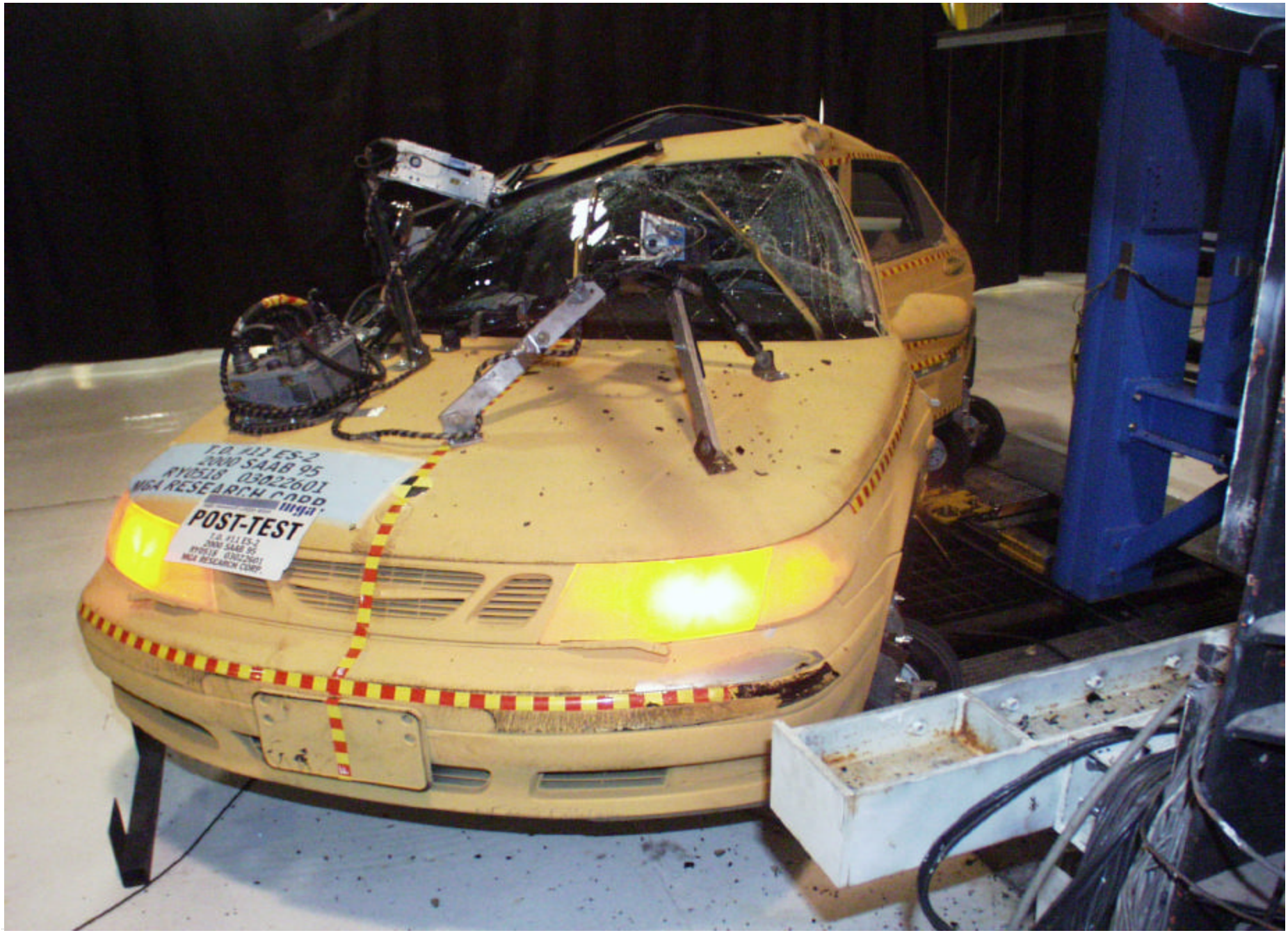
Pre-Test Left ¾ Front View of Test Vehicle

Post-Test Left ¾ Front View of Test Vehicle

Pre-Test Left ¾ Rear View of Test Vehicle

Post-Test Left ¾ Rear View of Test Vehicle

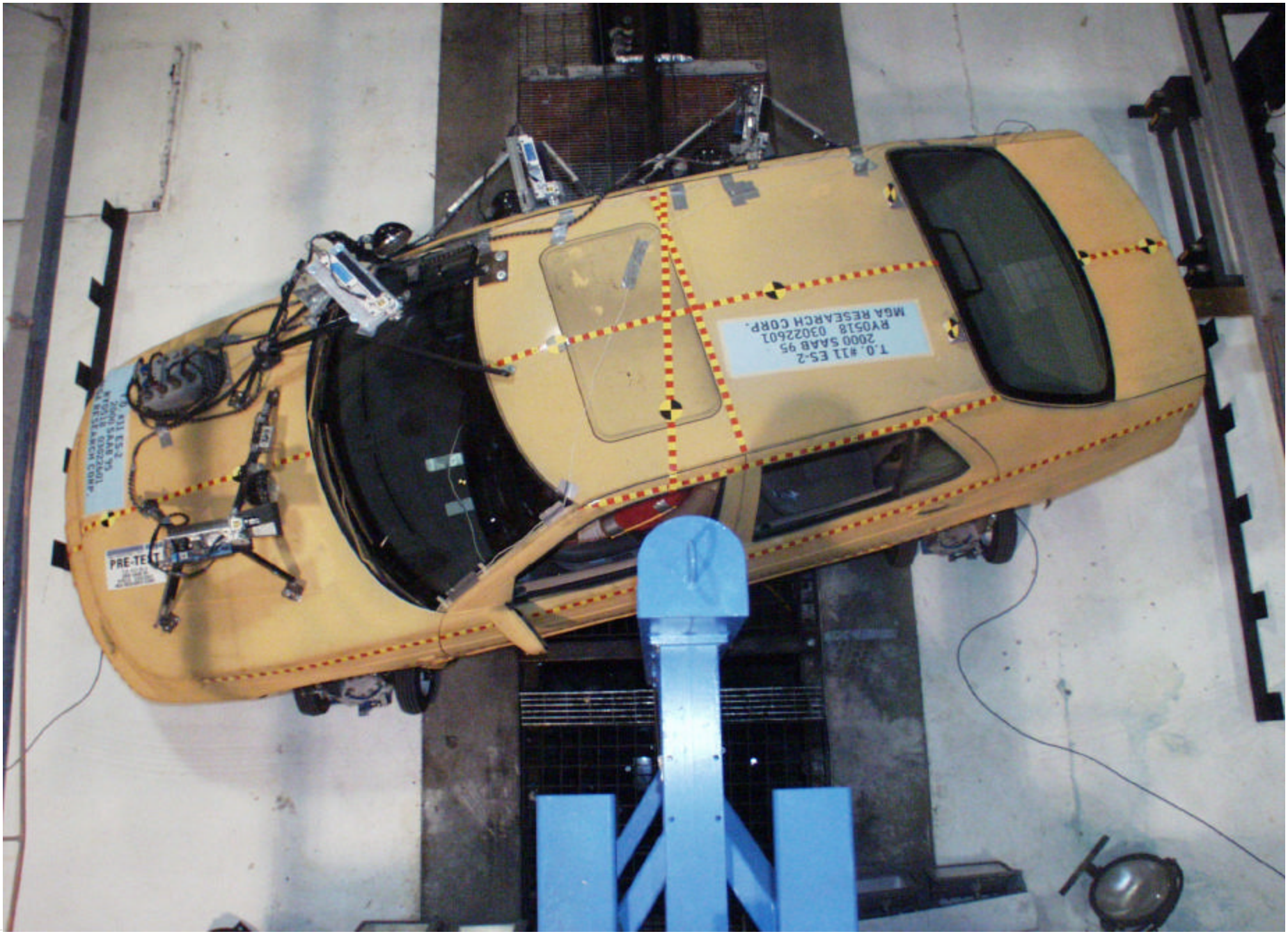
Pre-Test Vehicle Positioned Against Pole (left side)



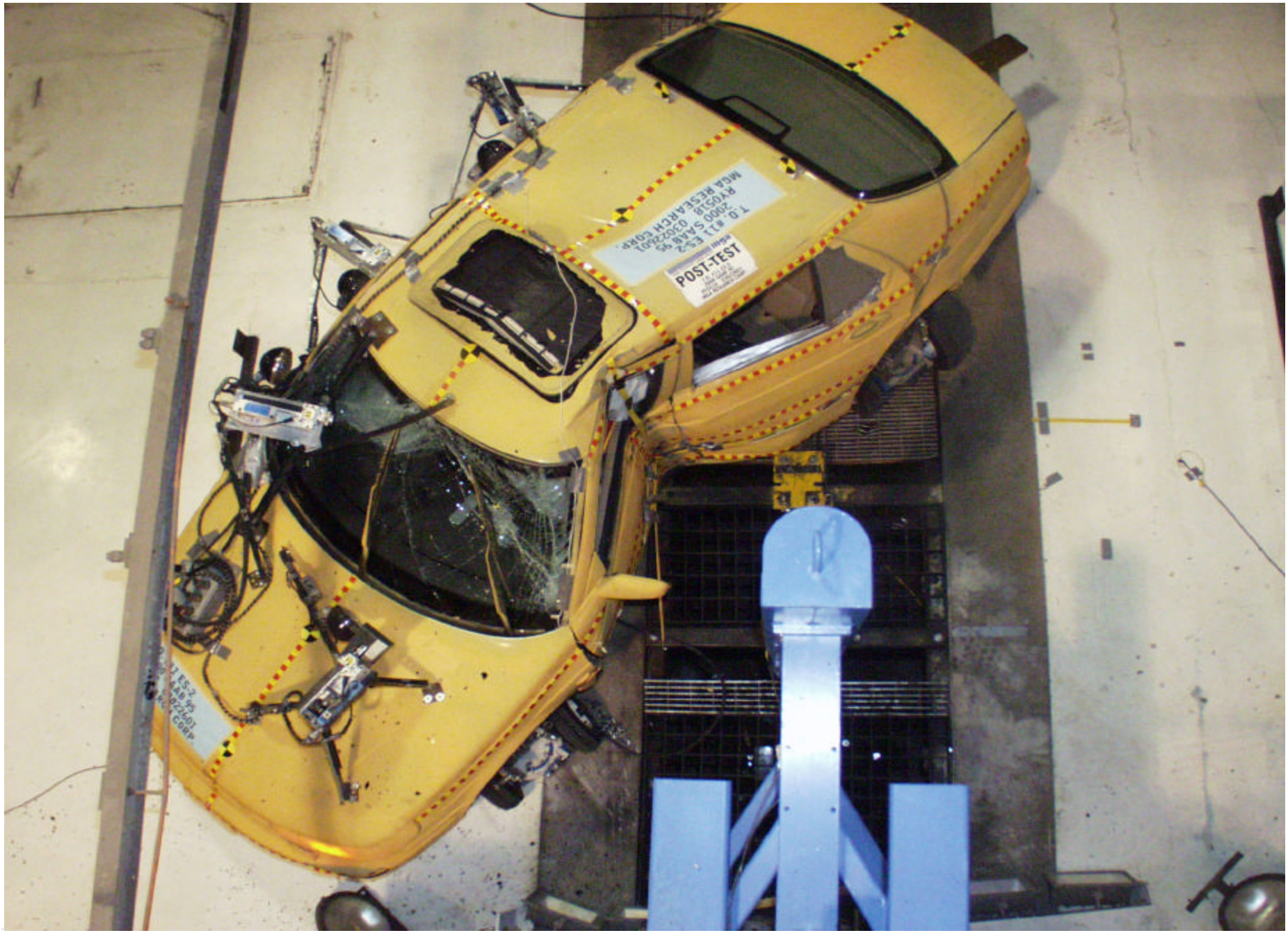
Post-Test Pole and Vehicle (left side)

Pre-Test Vehicle Positioned Against Pole (right side)

Post-Test Pole and Vehicle (right side)



Pre-Test Vehicle Positioned Against Pole Overhead View



Post-Test Pole and Vehicle Overhead View

Pre-Test Driver Seat Position

Pre-Test Driver Dummy Left Side View (Door open)

Pre-Test Driver Dummy Left side View

Post-Test Driver Dummy Left Side View

Pre-Test Driver Dummy Right Side View

Post-Test Driver Dummy Right Side View

Post-Test Driver Dummy Contact

Post-Test Driver Dummy Lower Body Contact

Post-Test Driver Dummy Head Contact

Pre-Test Impact Point on Vehicle

Post-Test Impact Point on Vehicle

Post-Test Outside Airbag

Impact

APPENDIX B

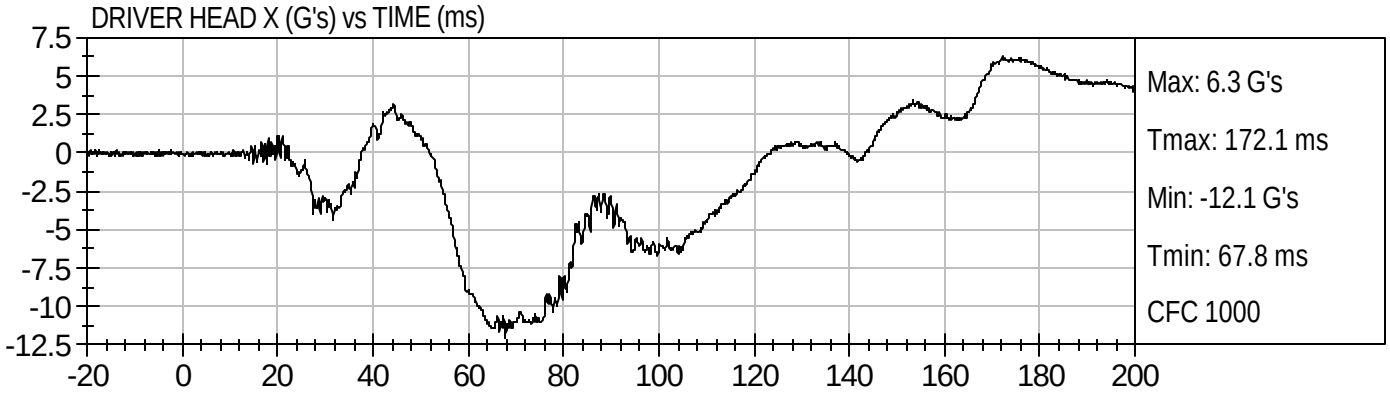
VEHICLE AND DUMMY RESPONSE DATA TRACES

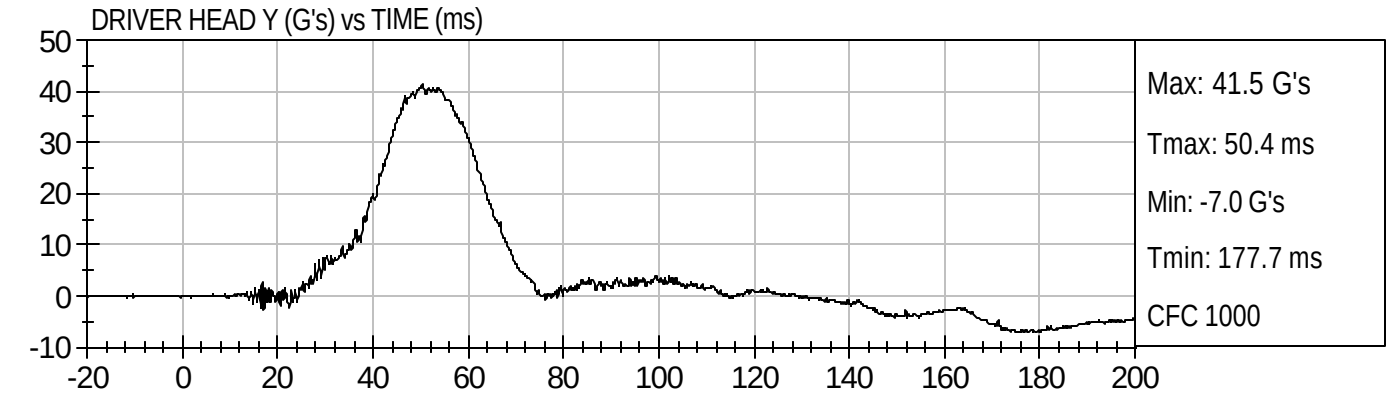
TABLE OF DATA PLOTS

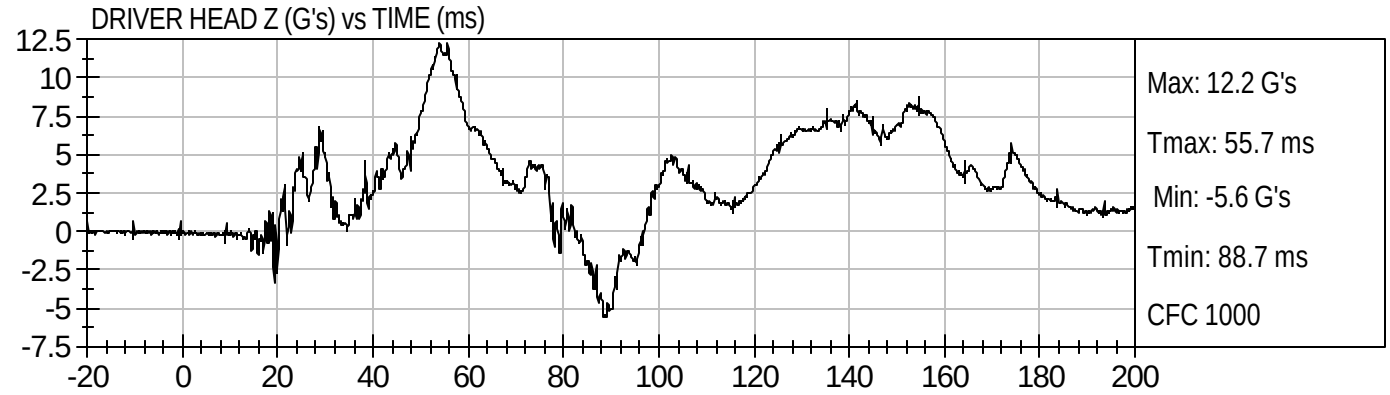
The dummy and vehicle X and Y velocities presented in this report do not contain the correct initial velocity. The correct initial velocities should be:
X – Test Speed * Sine 15 Degrees
Y – Test Speed * Cosine 15 Degrees

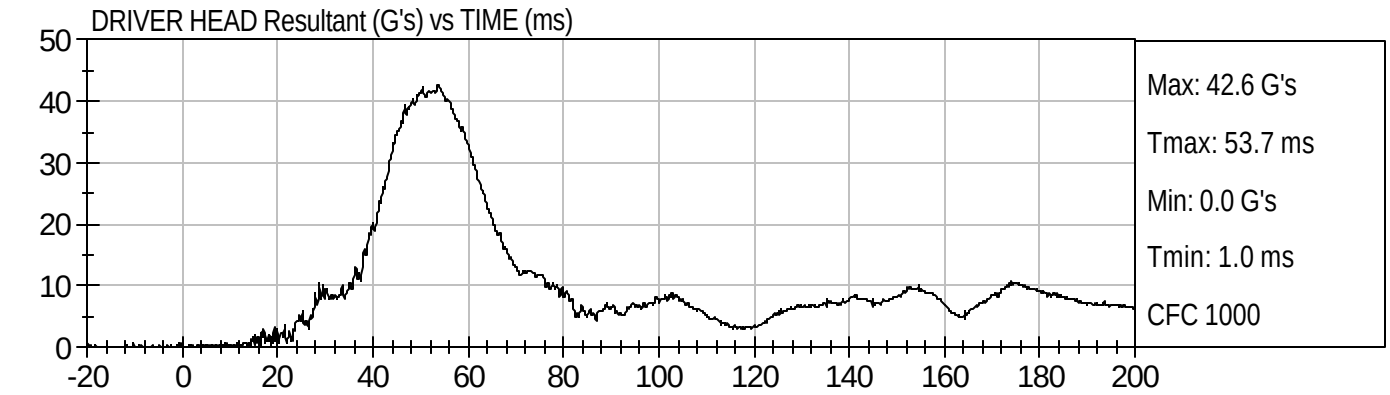
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



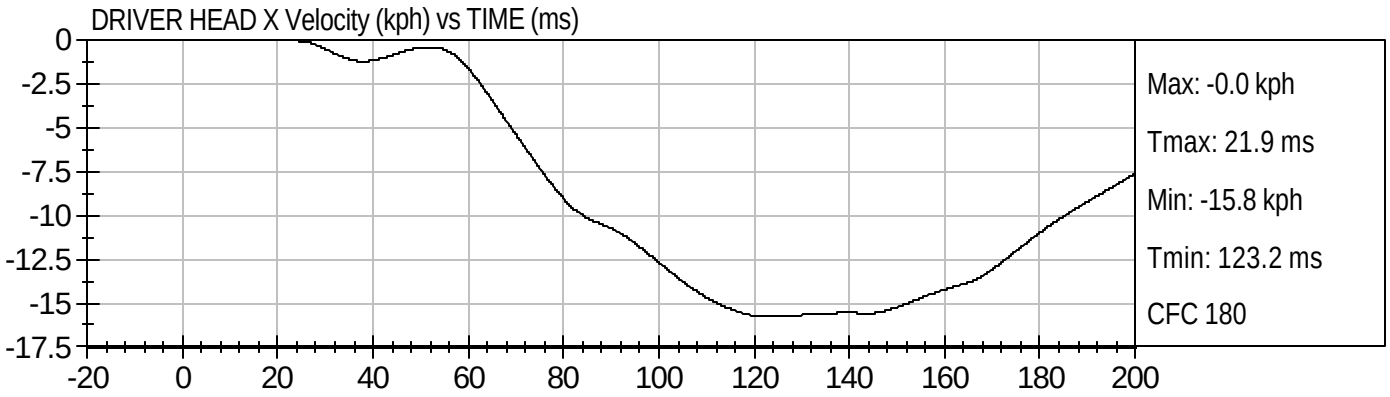


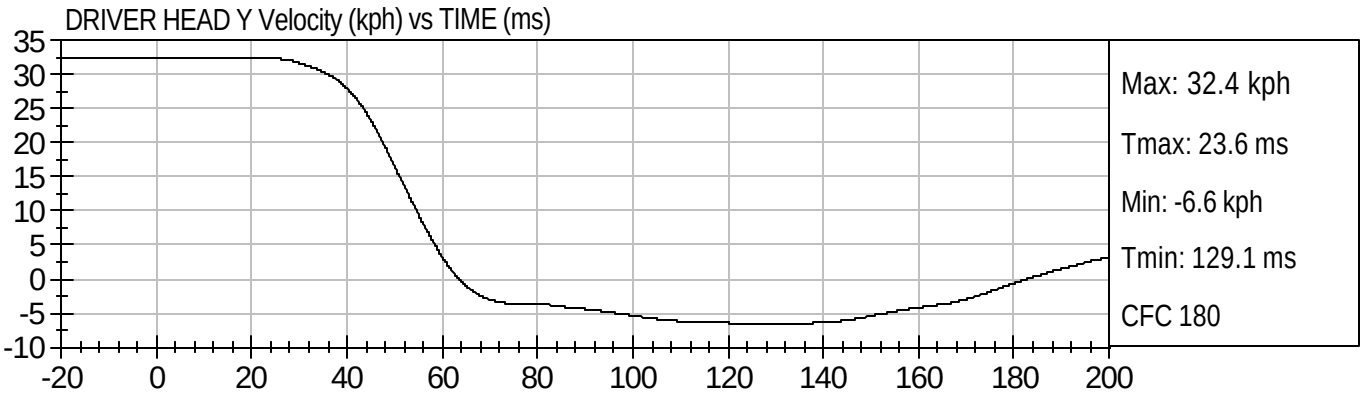


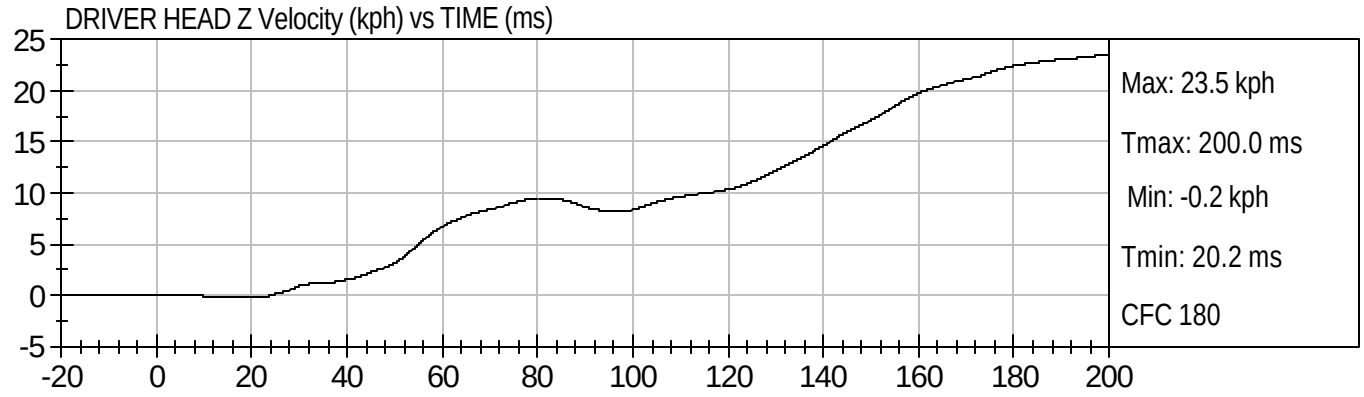


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

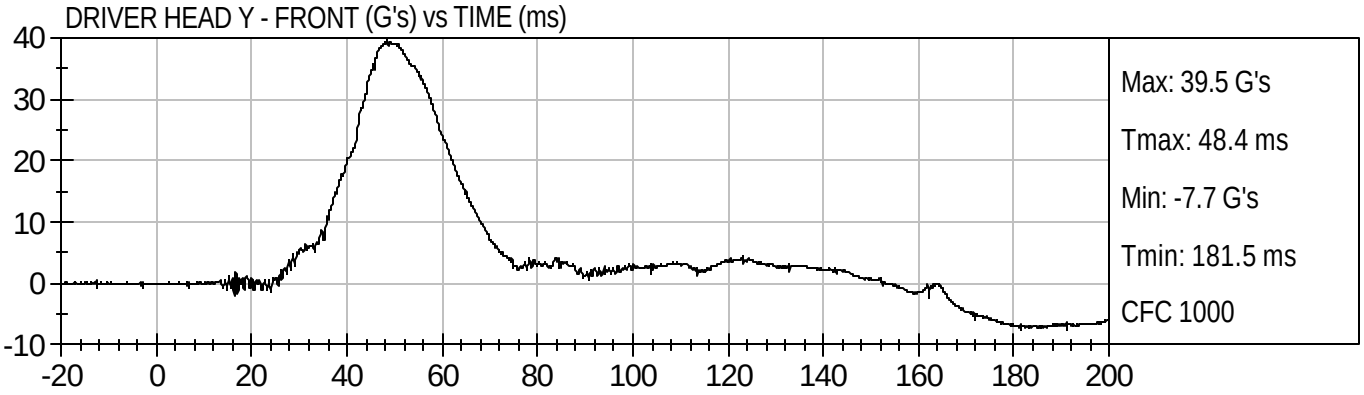


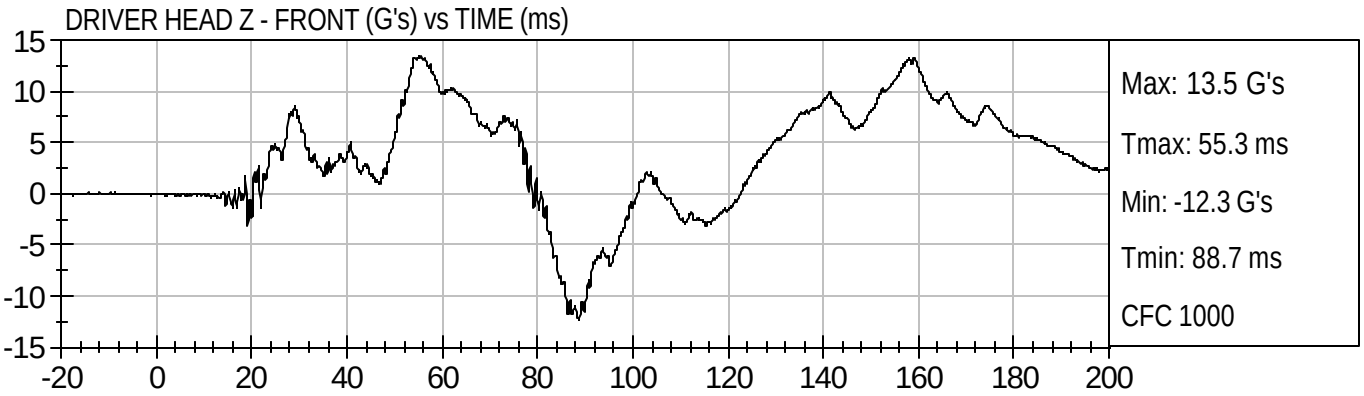


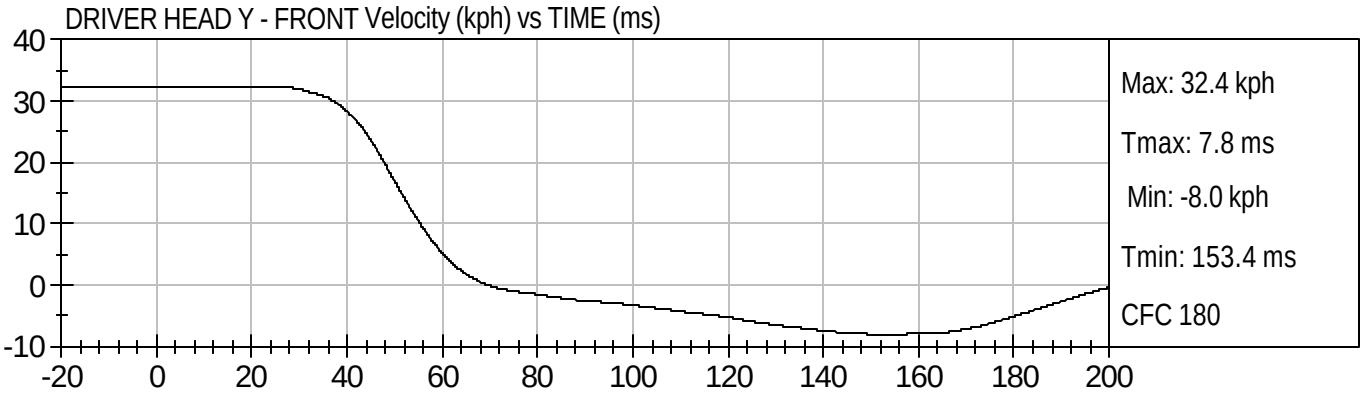


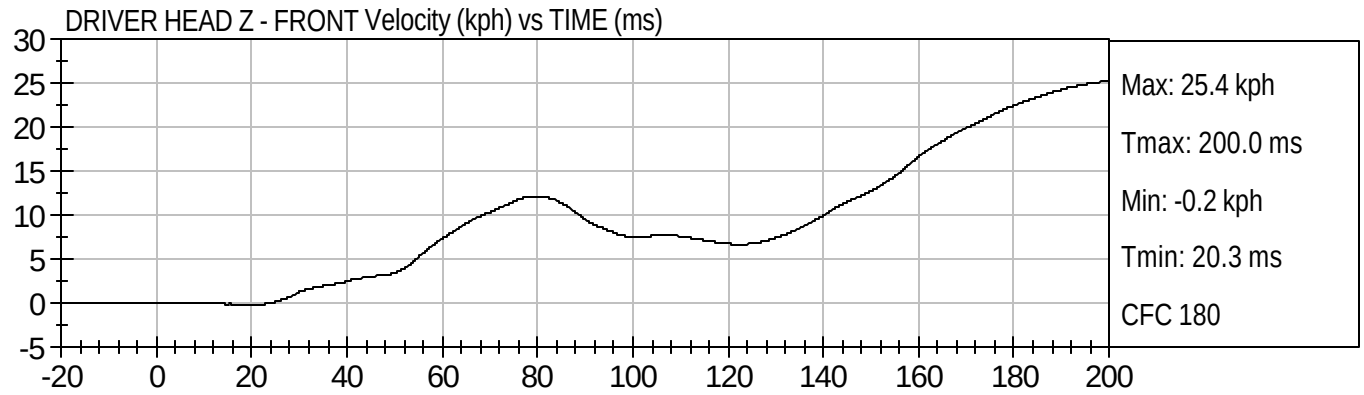
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



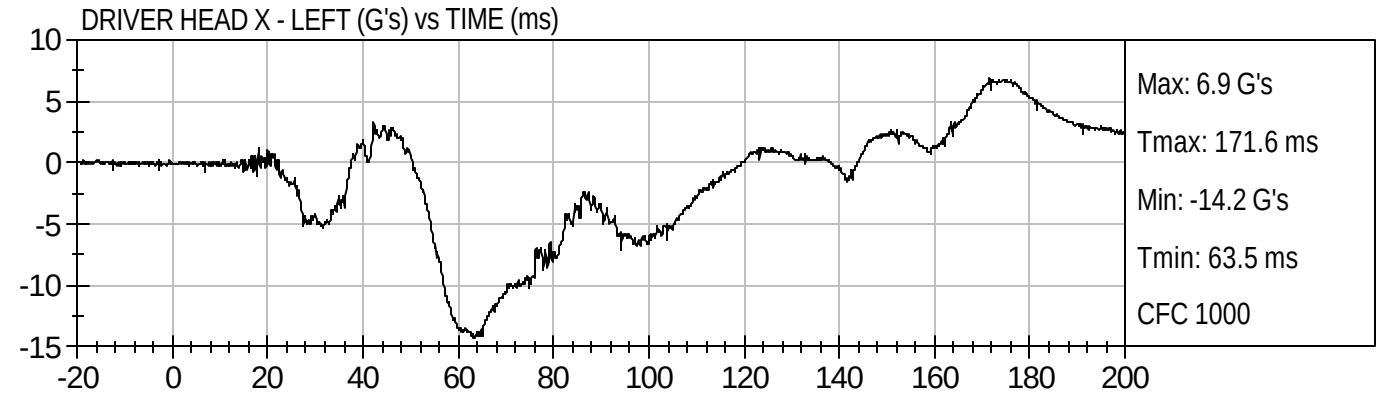


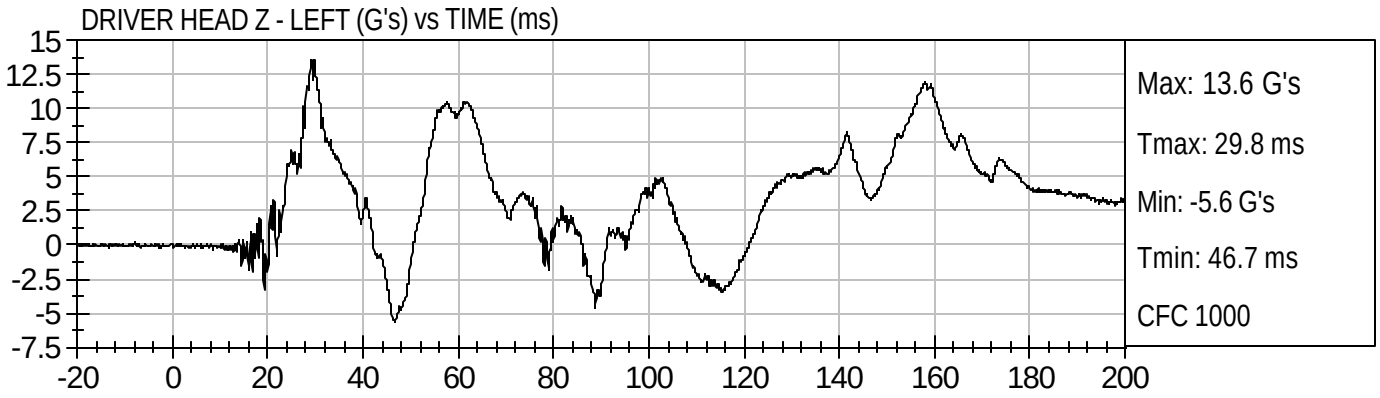


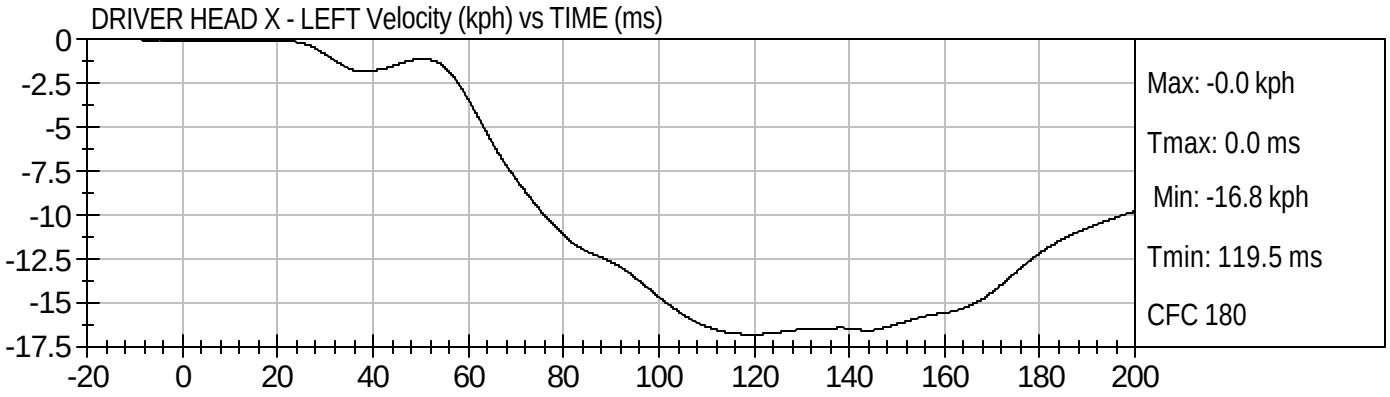


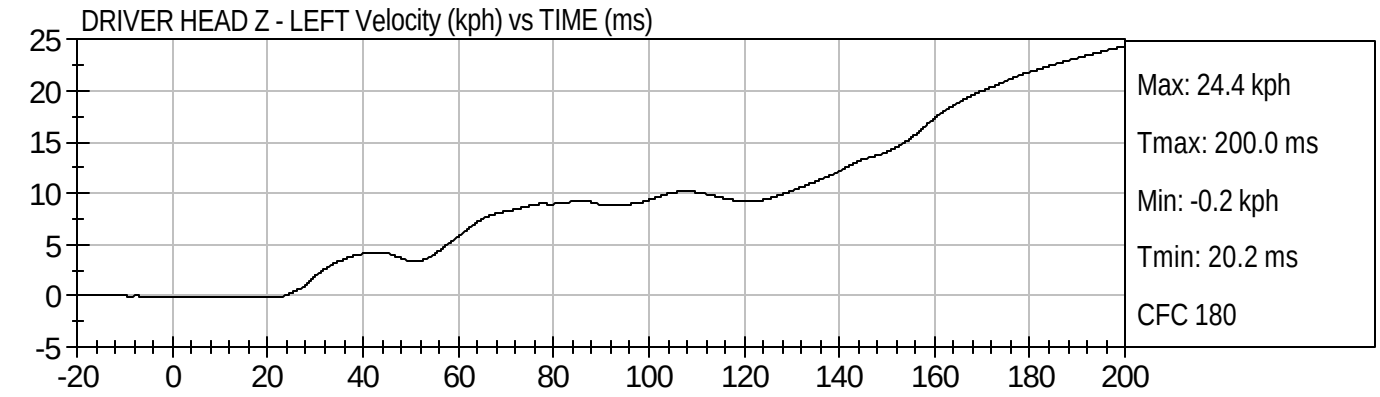
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



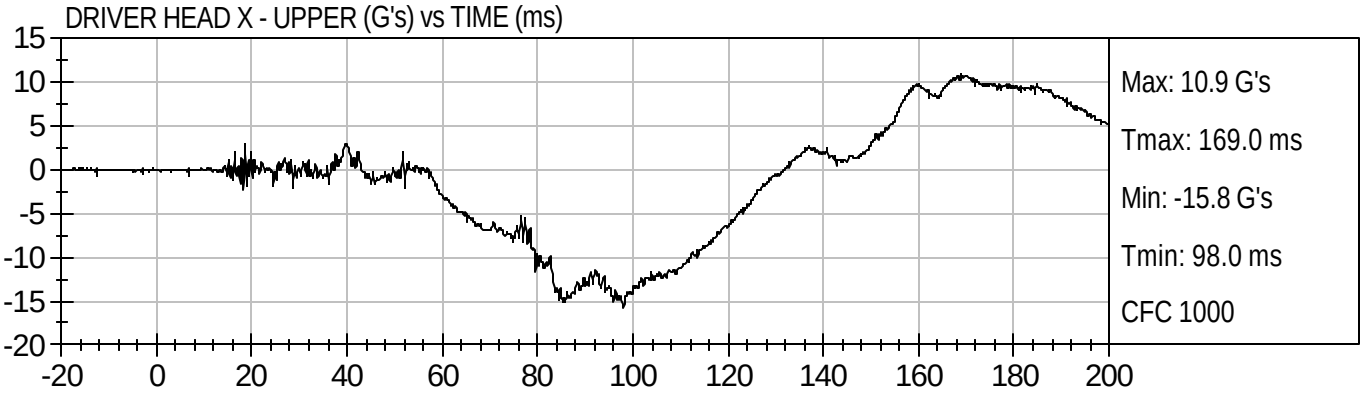


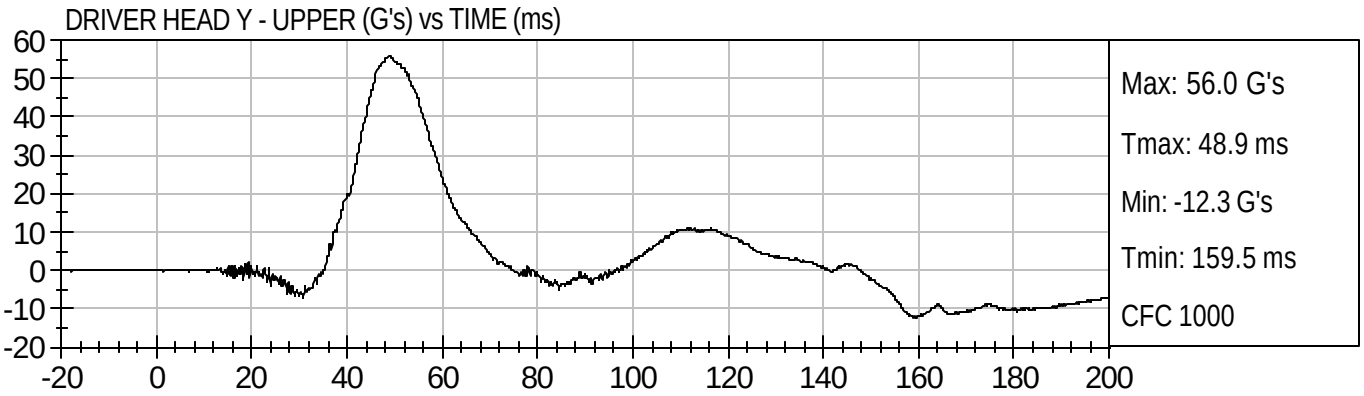


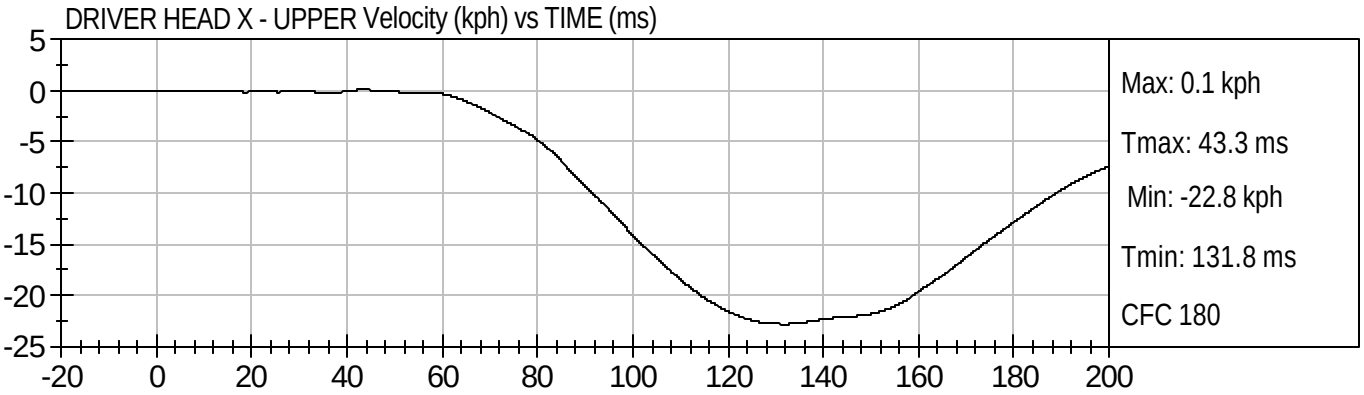


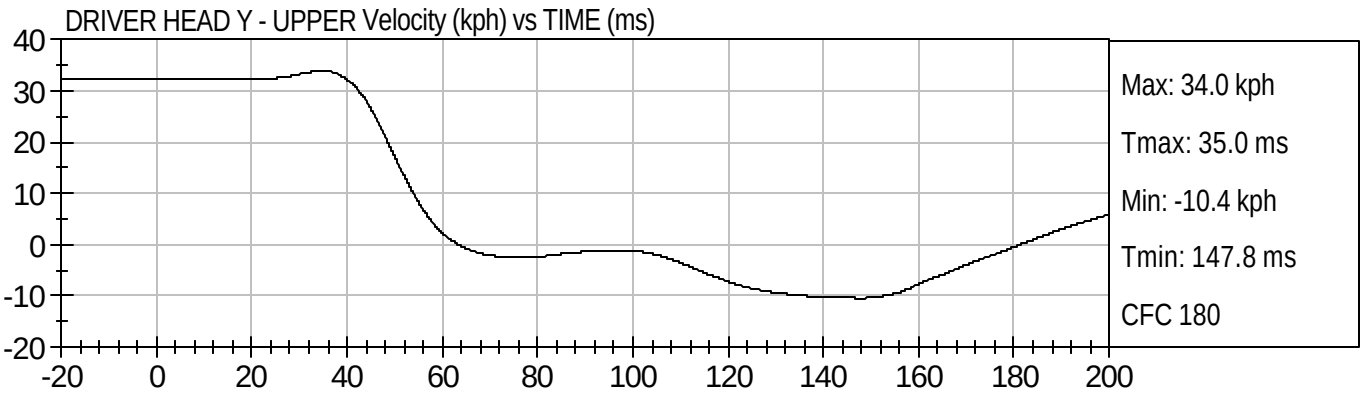
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



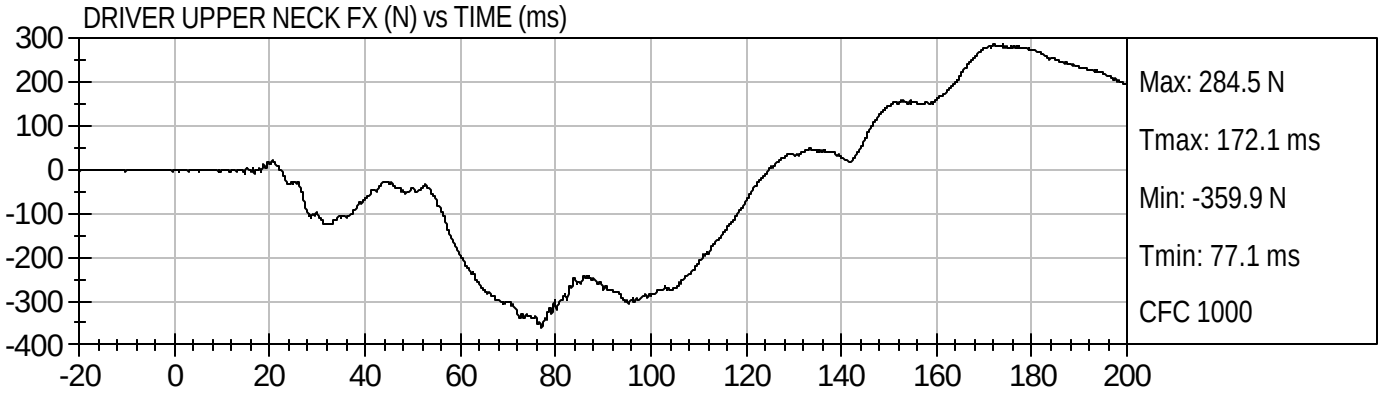


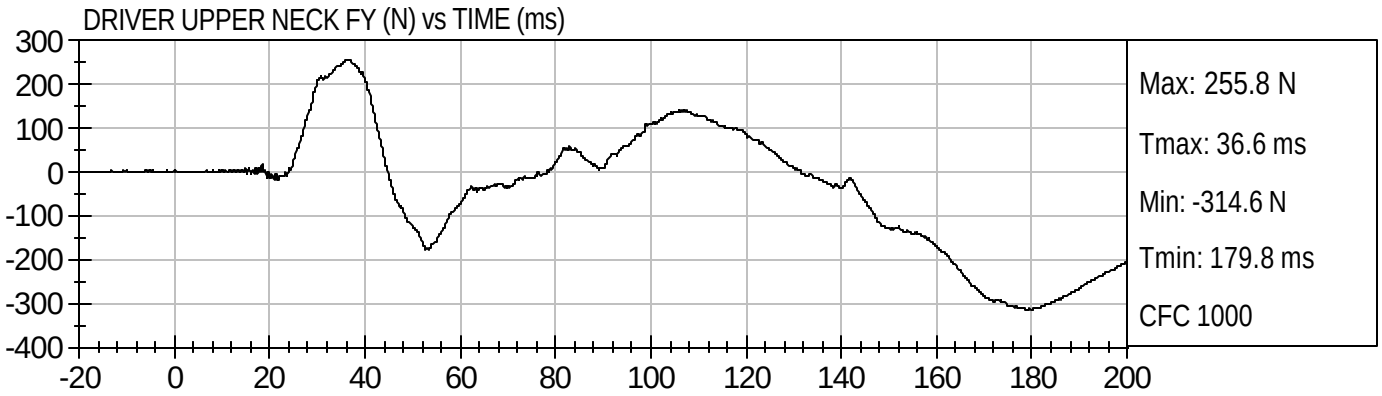


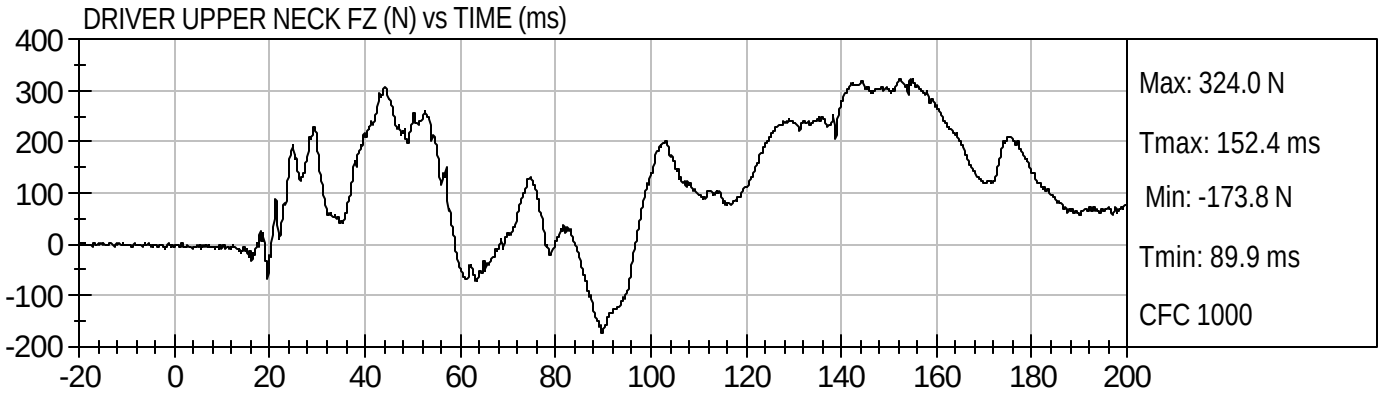


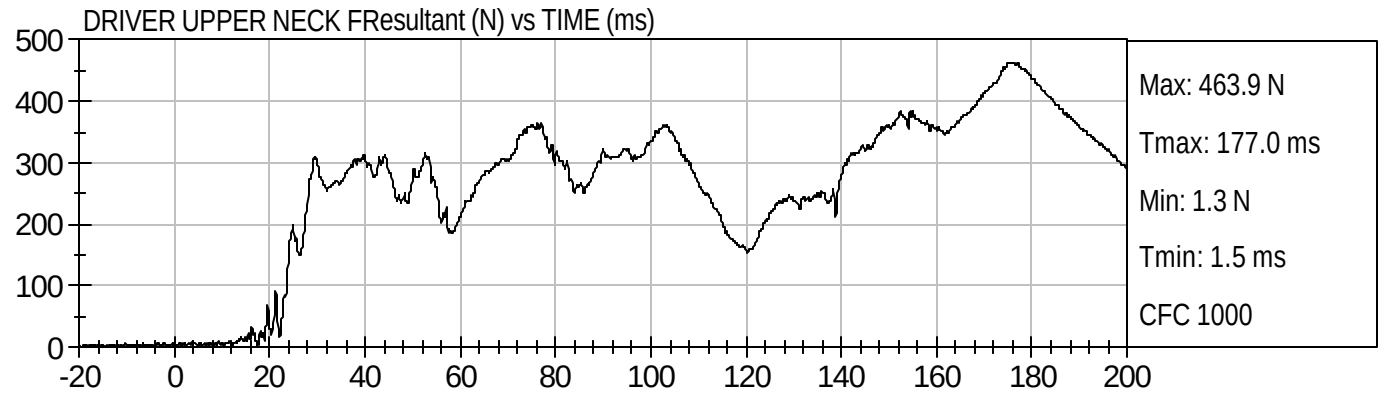
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)





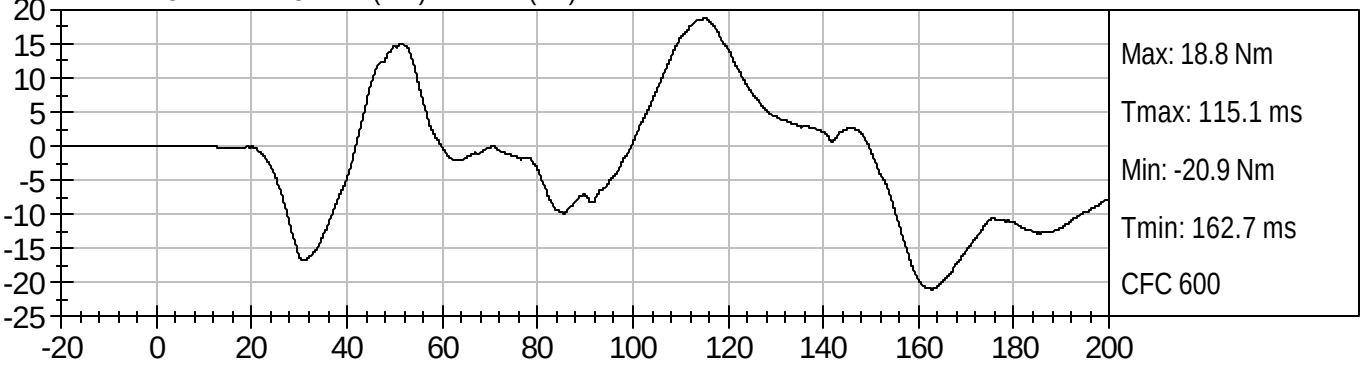




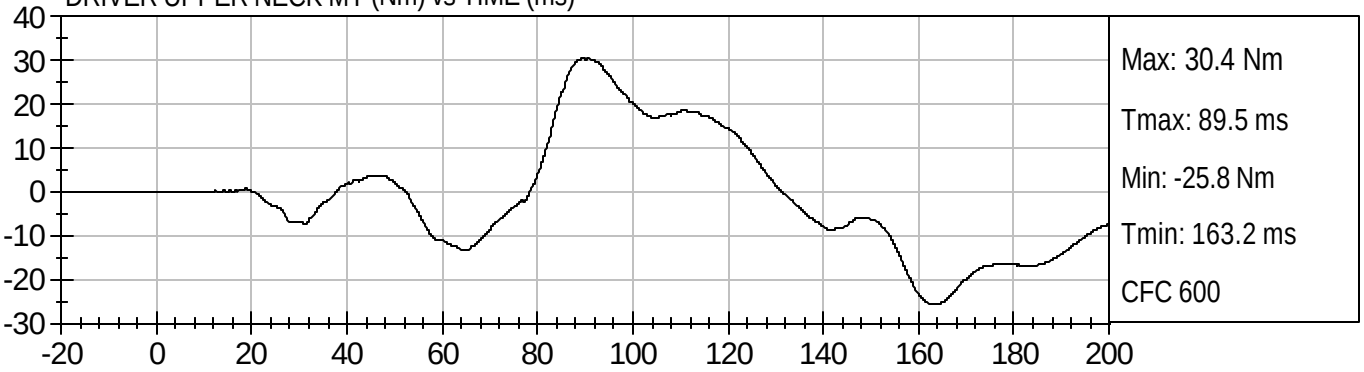
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

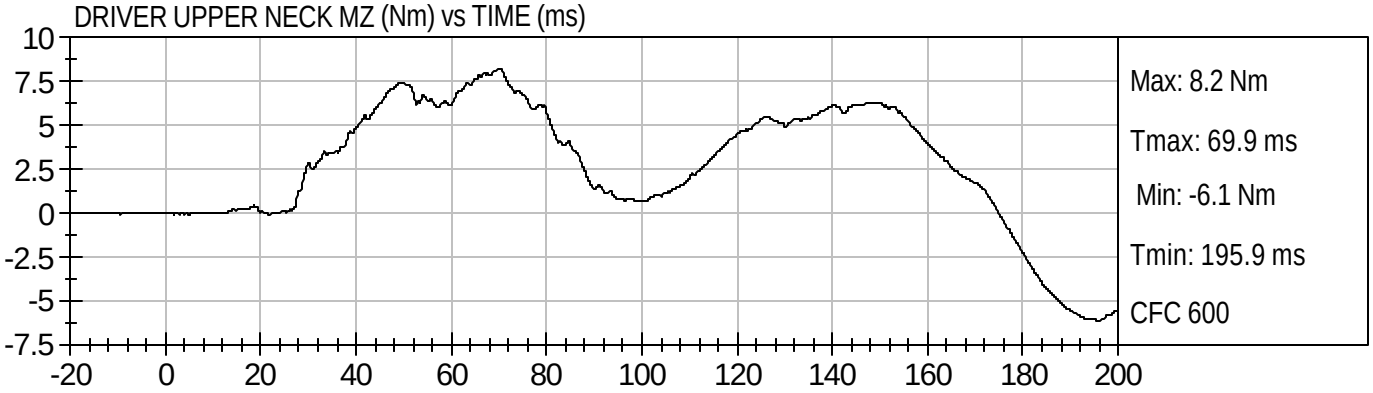
DRIVER UPPER NECK MX (Nm) vs TIME (ms)



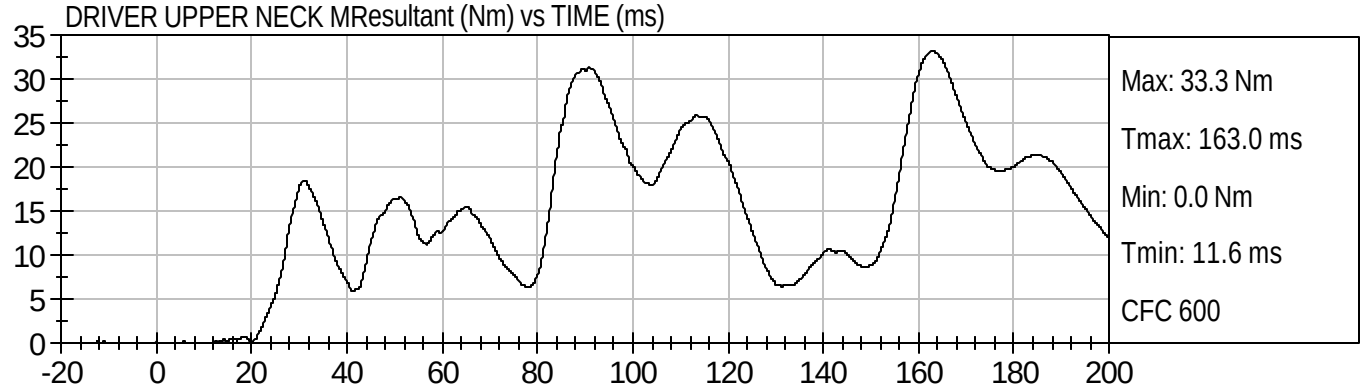
DRIVER UPPER NECK MY (Nm) vs TIME (ms)



DRIVER UPPER NECK MZ (Nm) vs TIME (ms)



DRIVER UPPER NECK MResultant (Nm) vs TIME (ms)



OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
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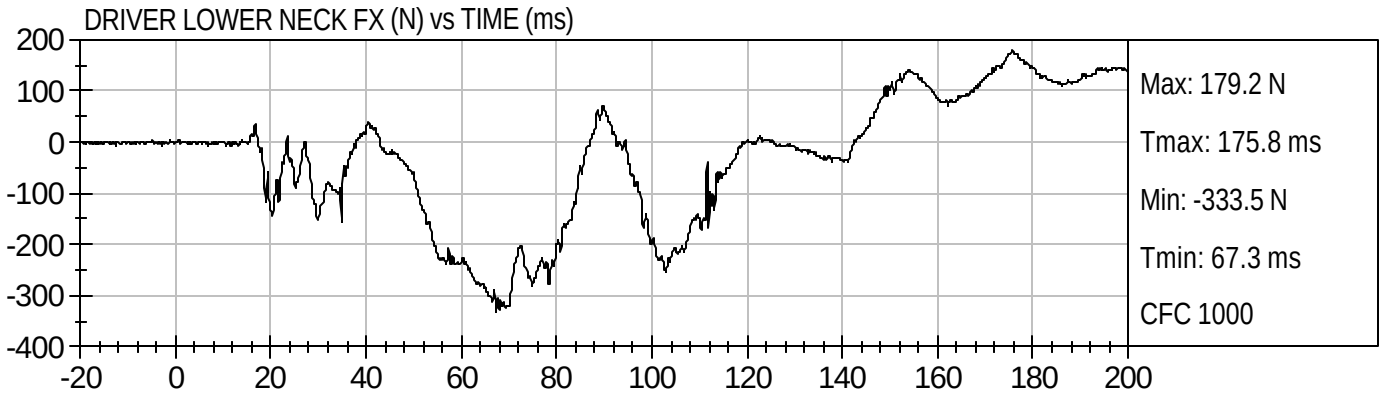
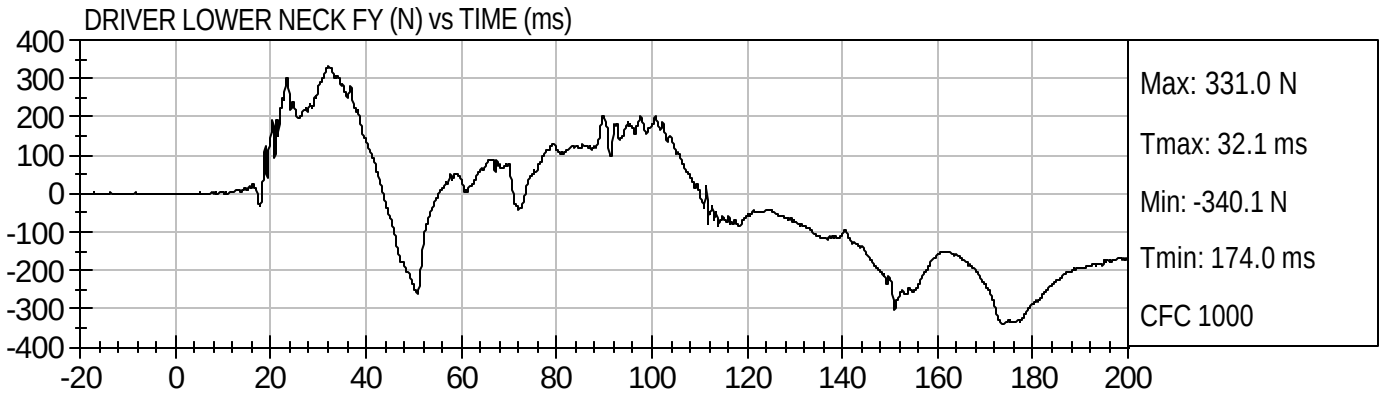
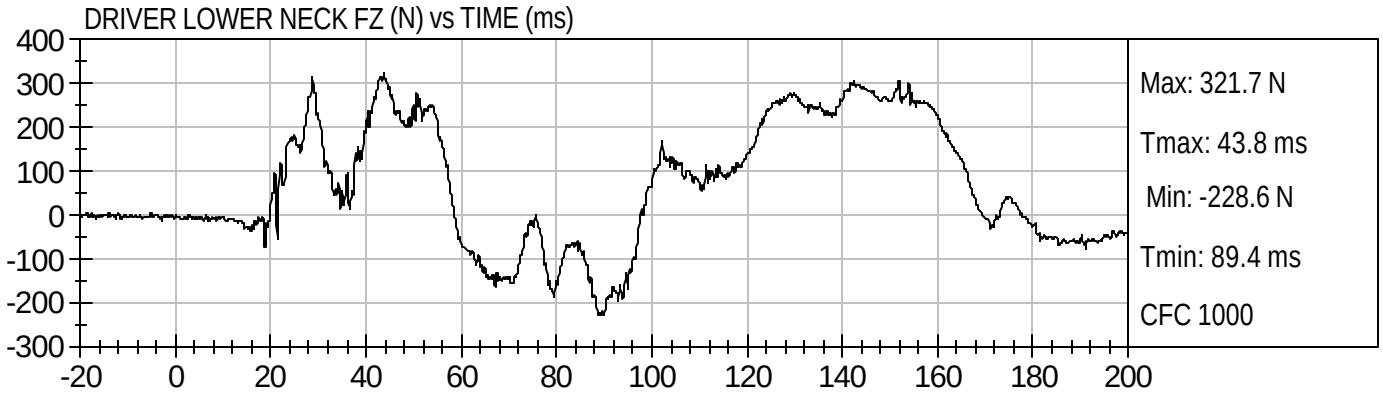
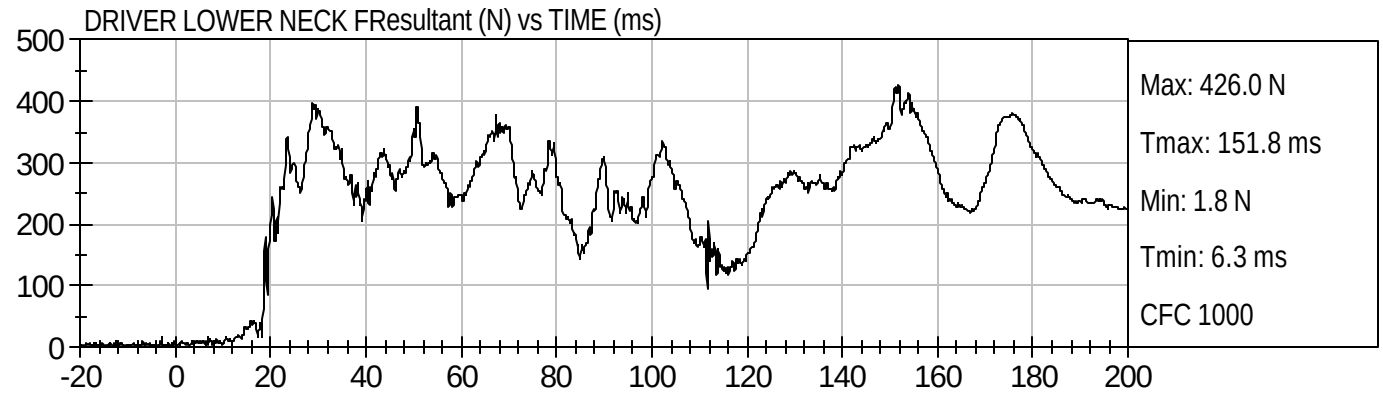


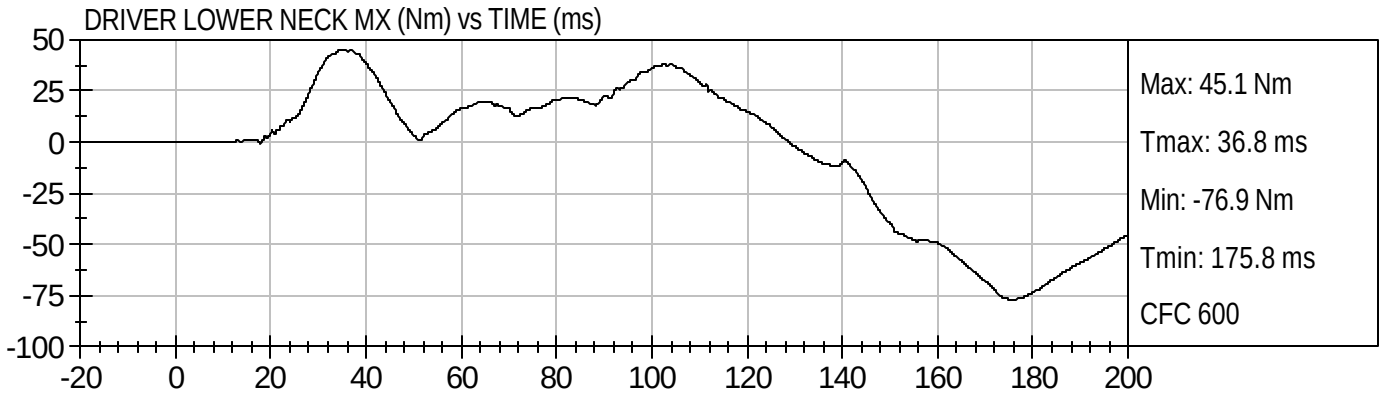


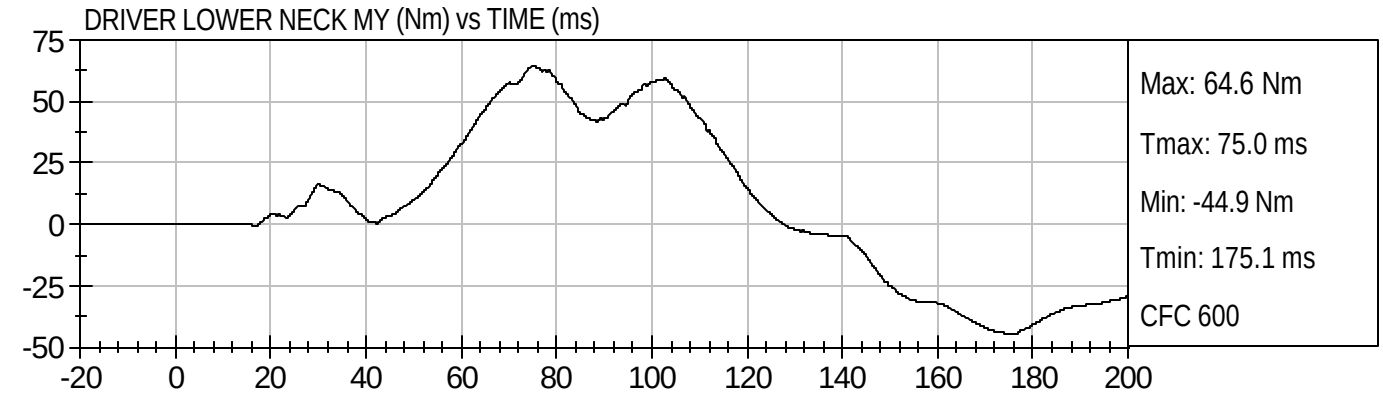


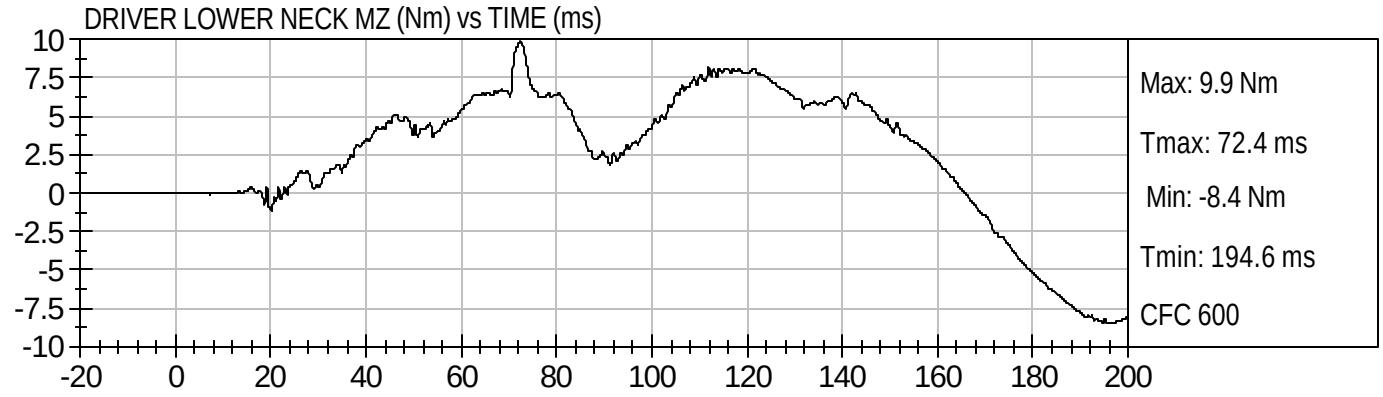


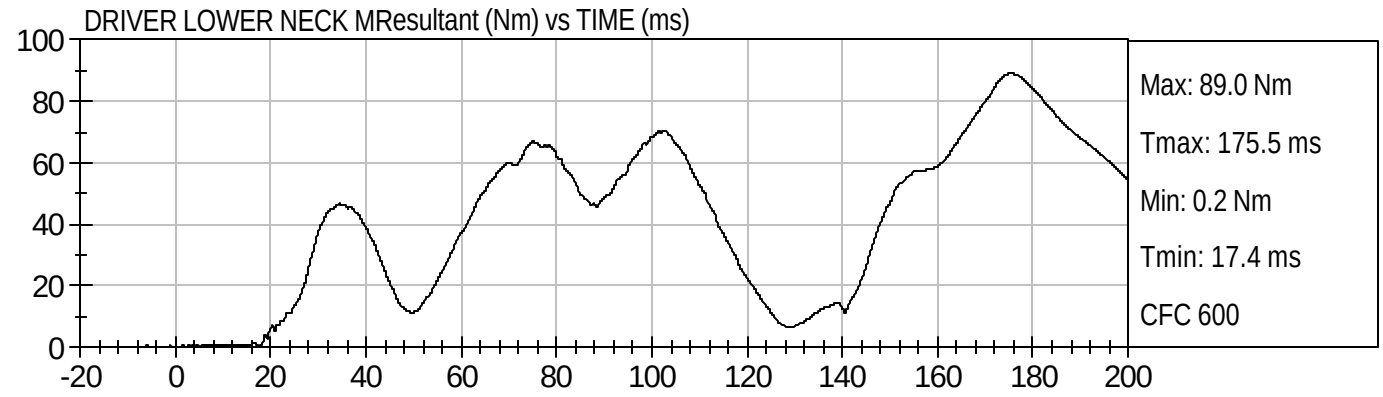
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



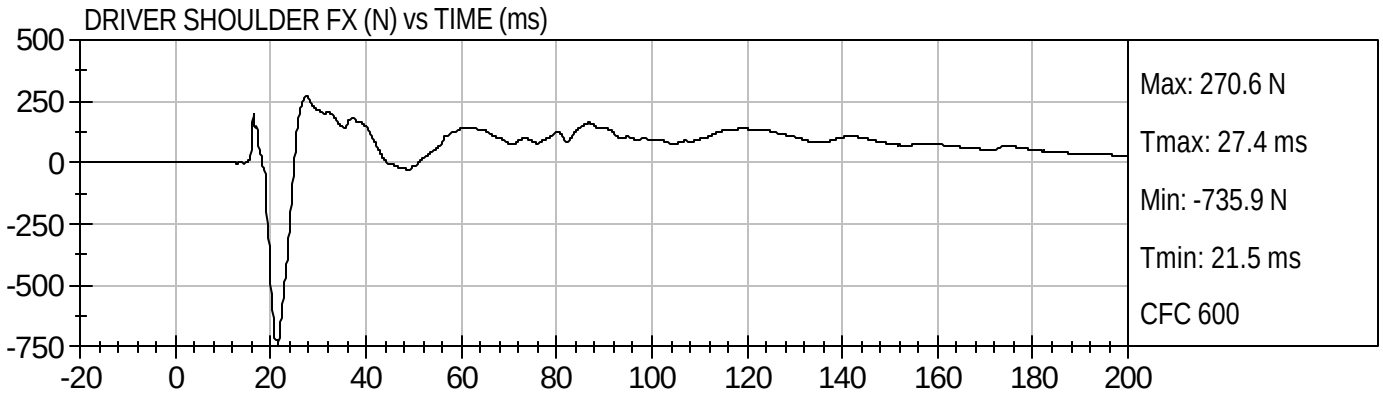


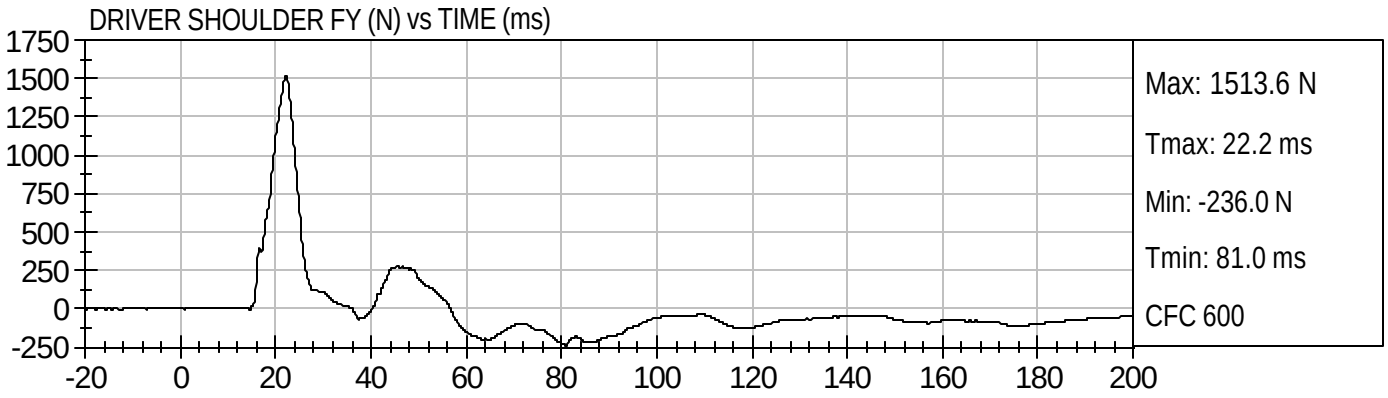


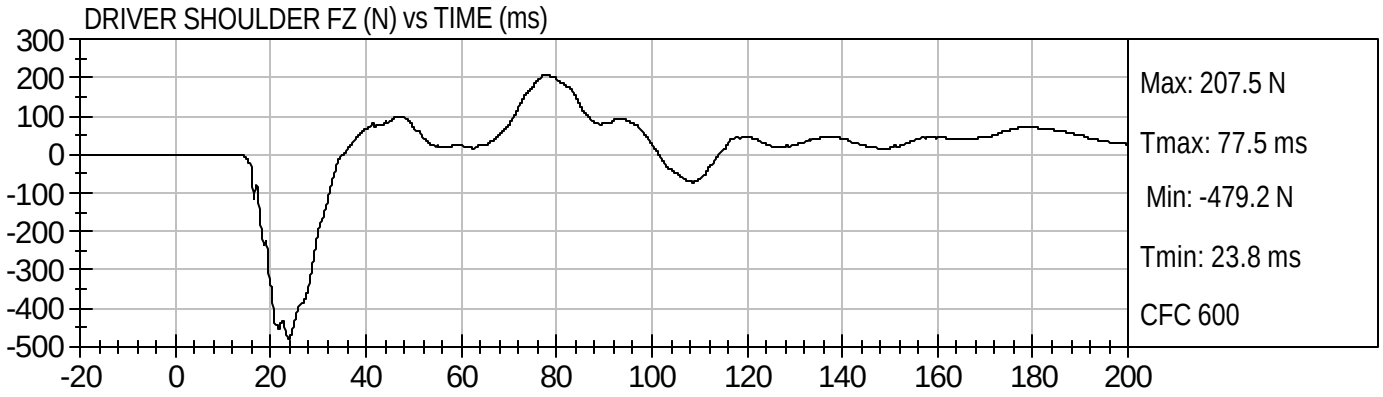


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

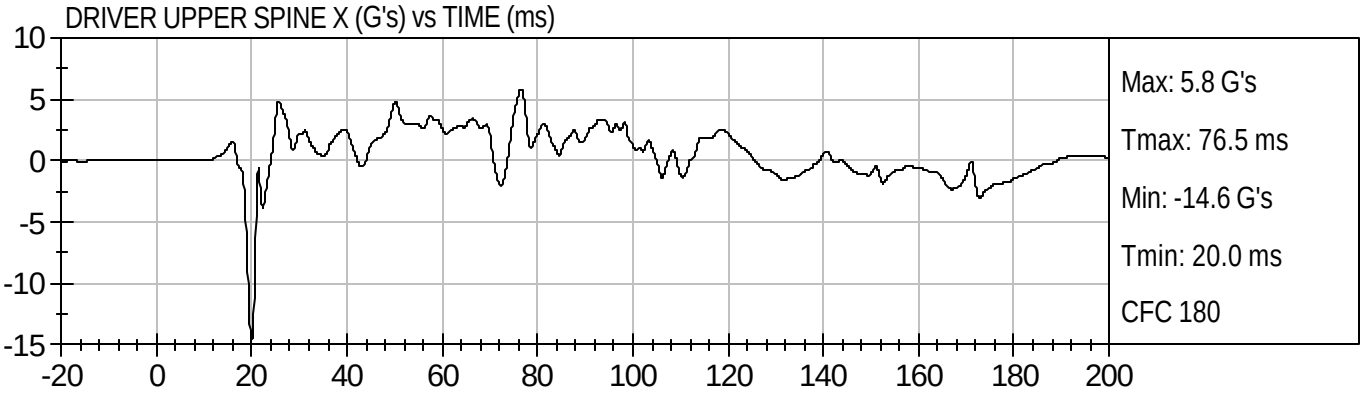


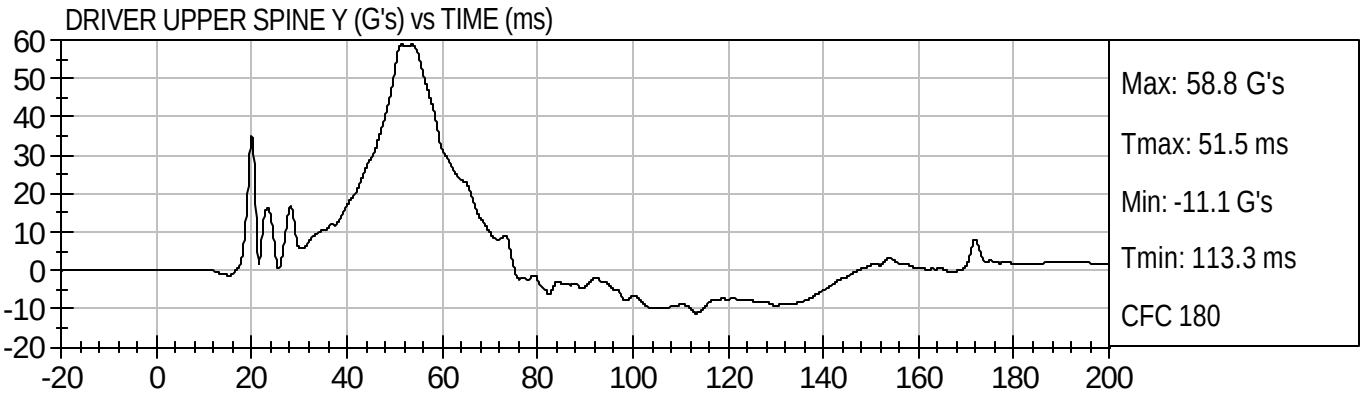


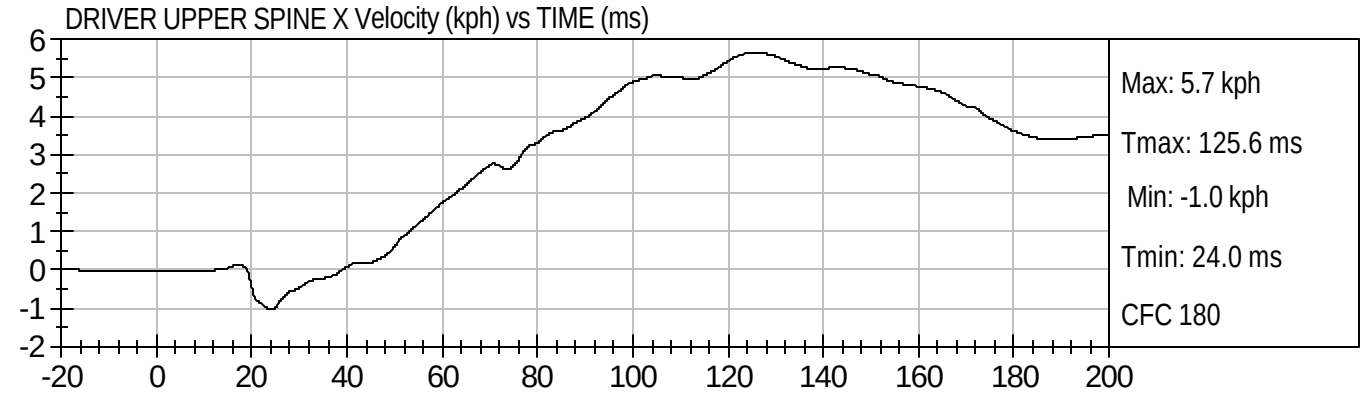


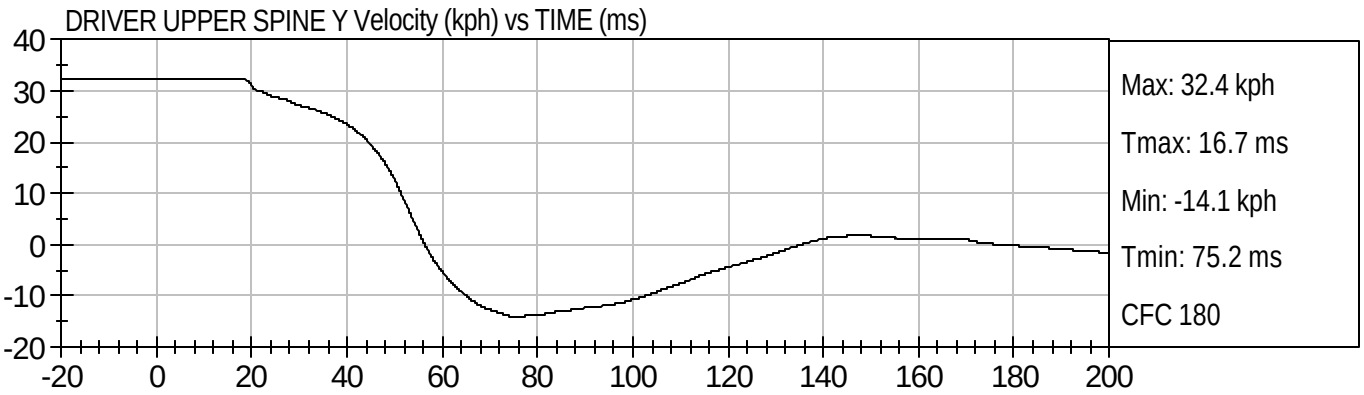
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)





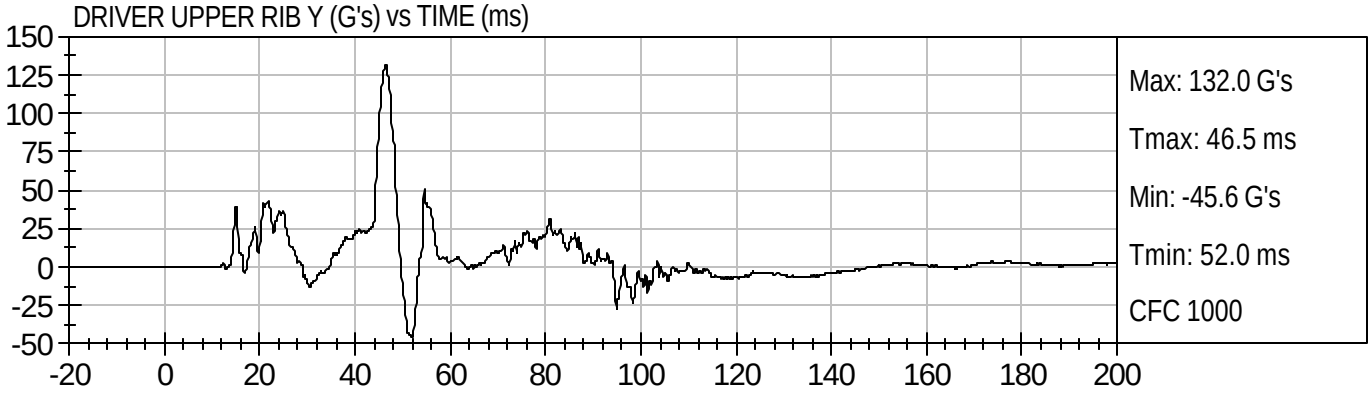




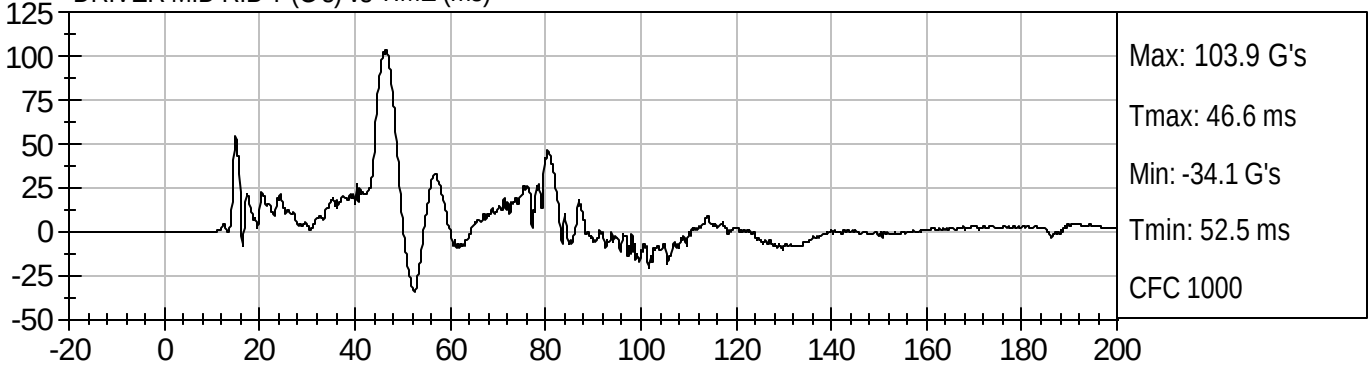
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

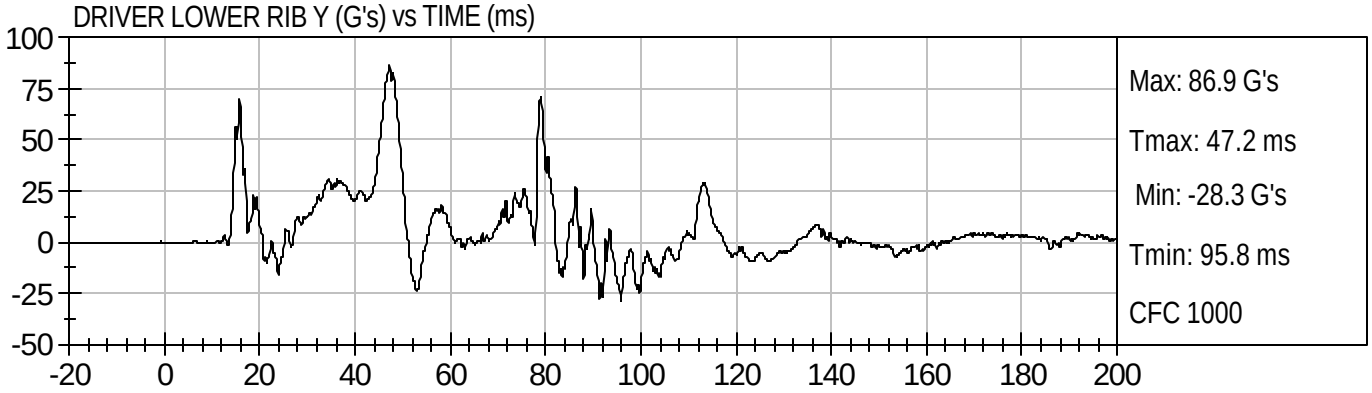
DRIVER UPPER RIB Y (G's) vs TIME (ms)



DRIVER MID RIB Y (G's) vs TIME (ms)



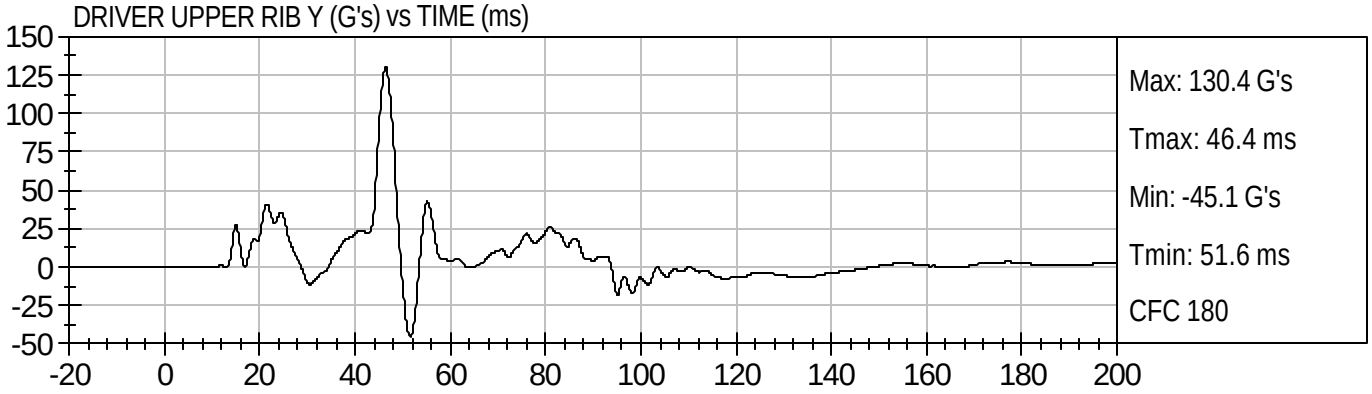
DRIVER LOWER RIB Y (G's) vs TIME (ms)



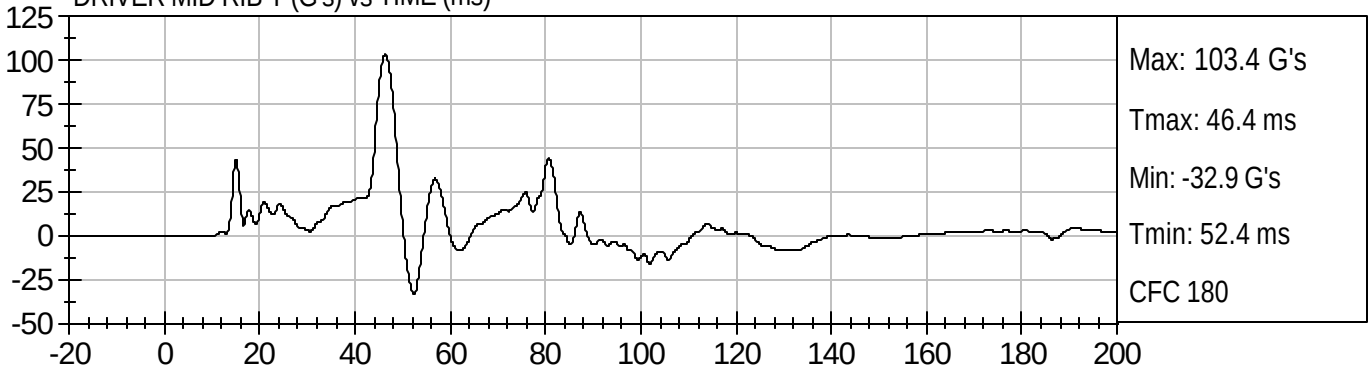
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

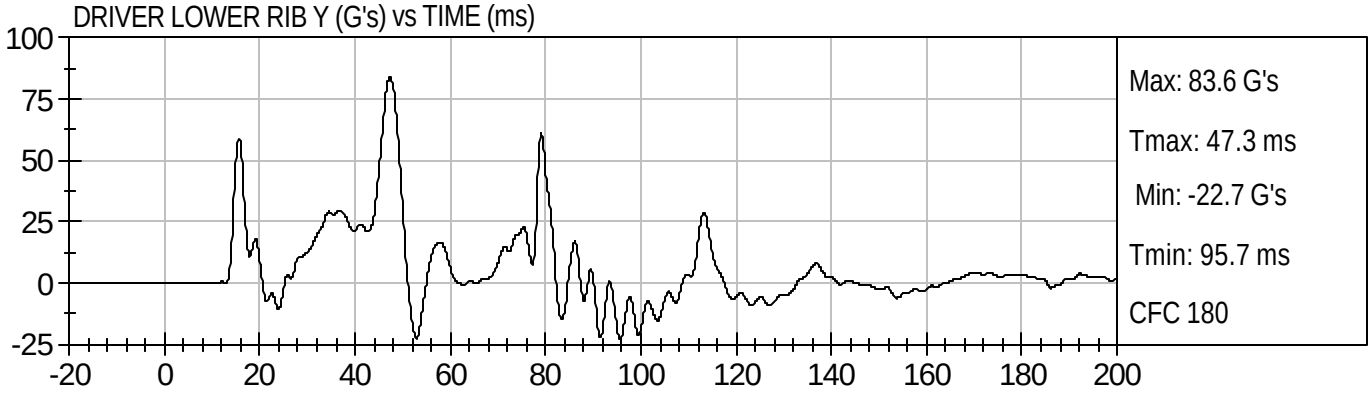
DRIVER UPPER RIB Y (G's) vs TIME (ms)

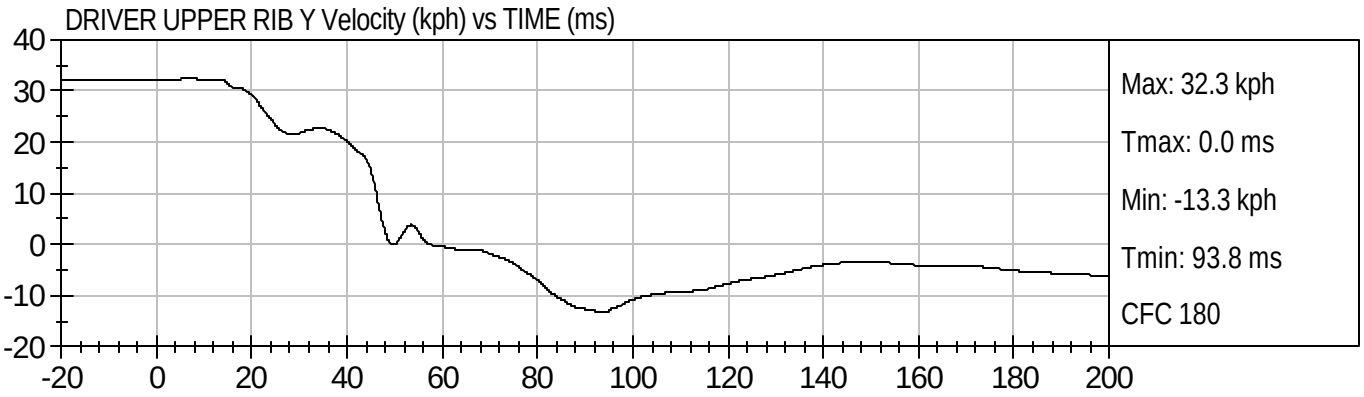


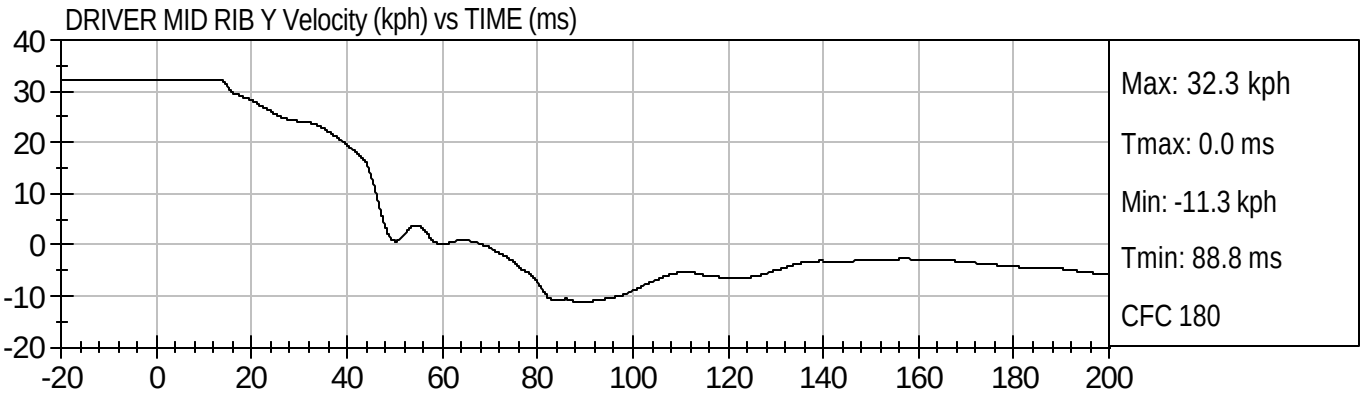
DRIVER MID RIB Y (G's) vs TIME (ms)

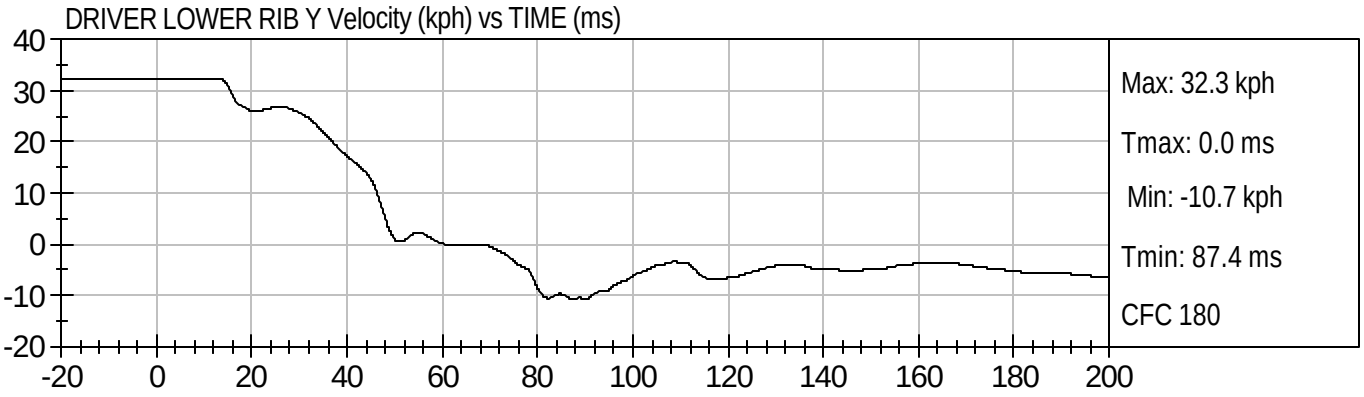


DRIVER LOWER RIB Y (G's) vs TIME (ms)




DRIVER UPPER RIB Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.3 kph
Tmax: 0.0 ms
Min: -13.3 kph
Tmin: 93.8 ms
CFC 180

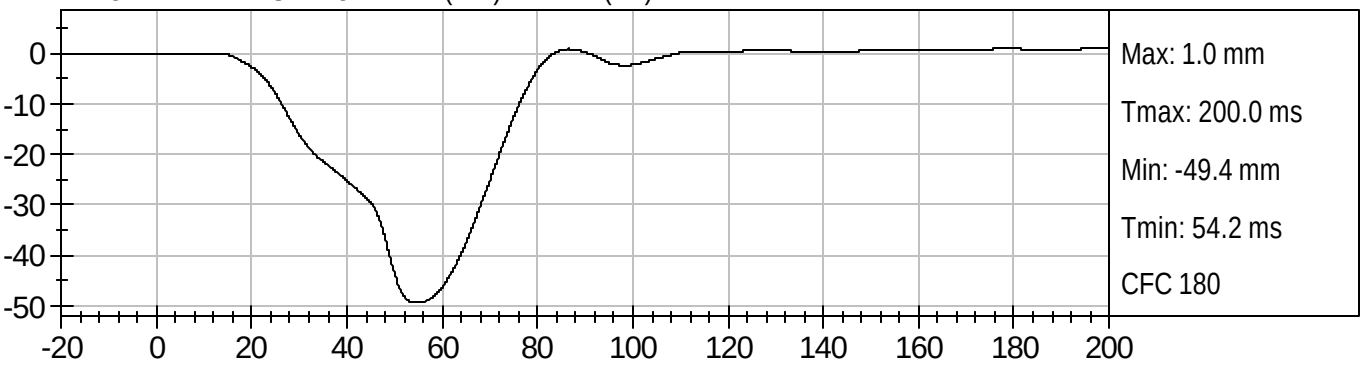

DRIVER MID RIB Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.3 kph
Tmax: 0.0 ms
Min: -11.3 kph
Tmin: 88.8 ms
CFC 180


DRIVER LOWER RIB Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.3 kph
Tmax: 0.0 ms
Min: -10.7 kph
Tmin: 87.4 ms
CFC 180

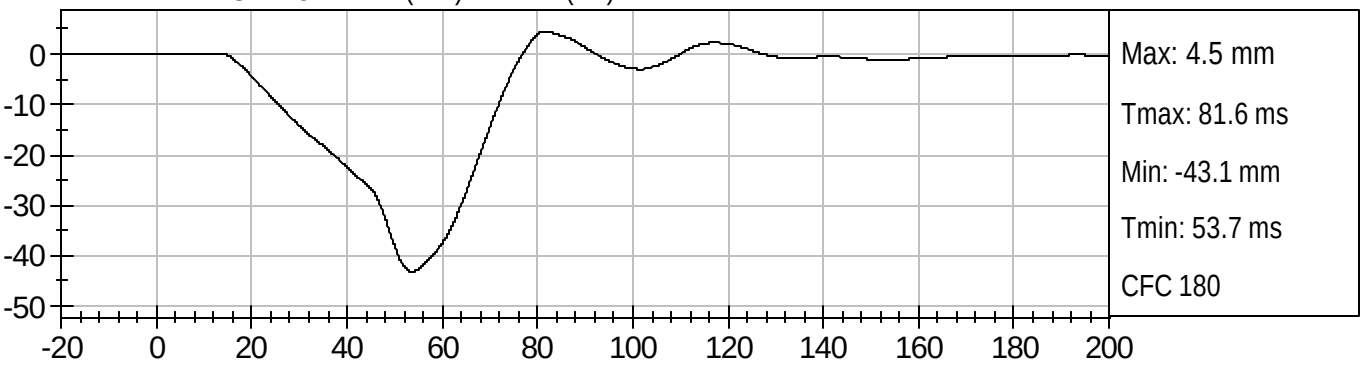
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

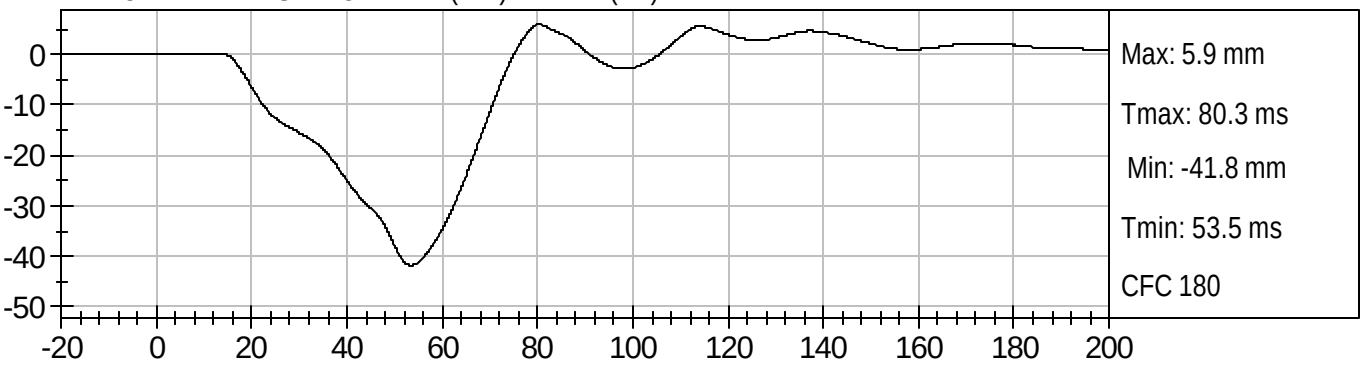
DR UPPER RIB DISPLACEMENT (mm) vs TIME (ms)



DR MID RIB DISPLACEMENT (mm) vs TIME (ms)

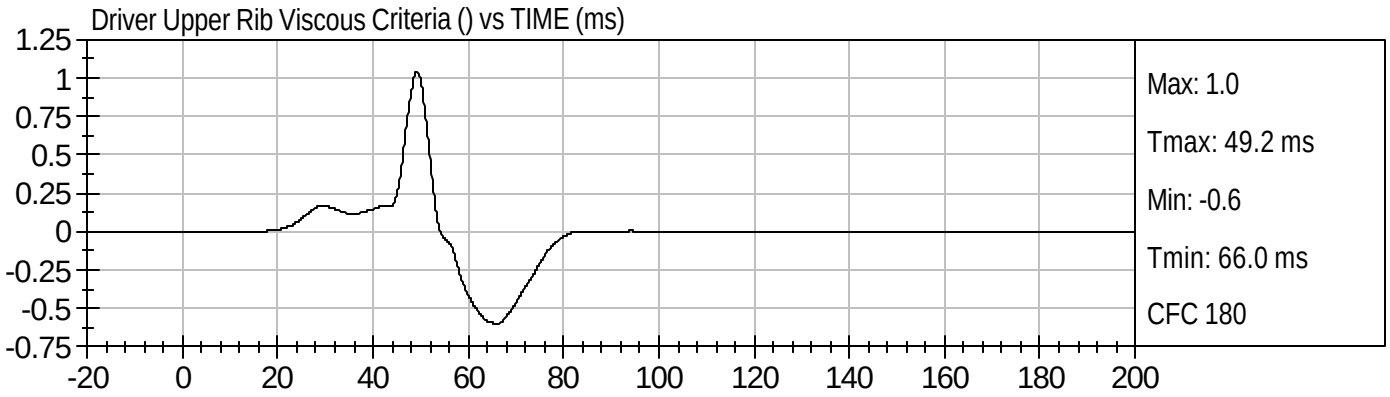


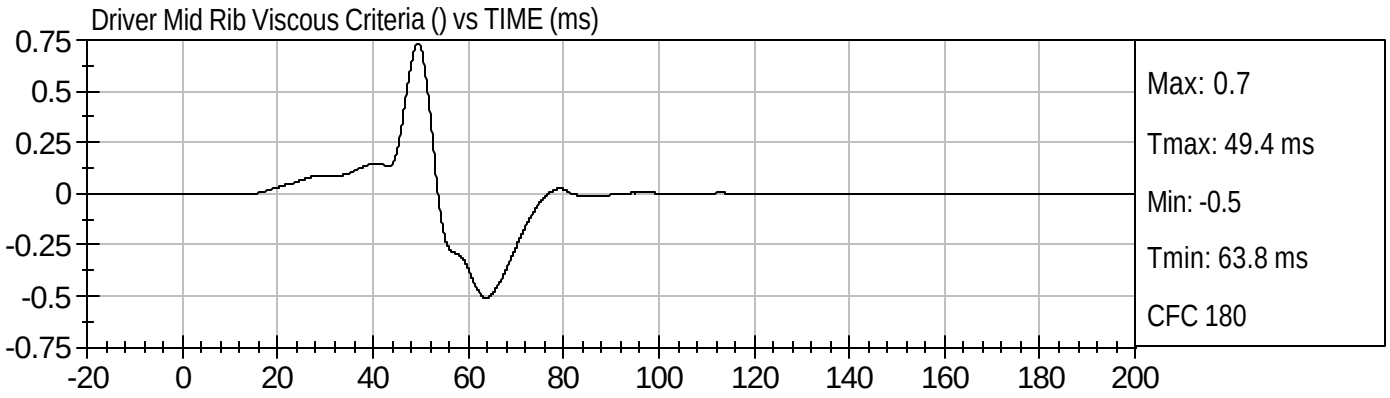
DR LOWER RIB DISPLACEMENT (mm) vs TIME (ms)

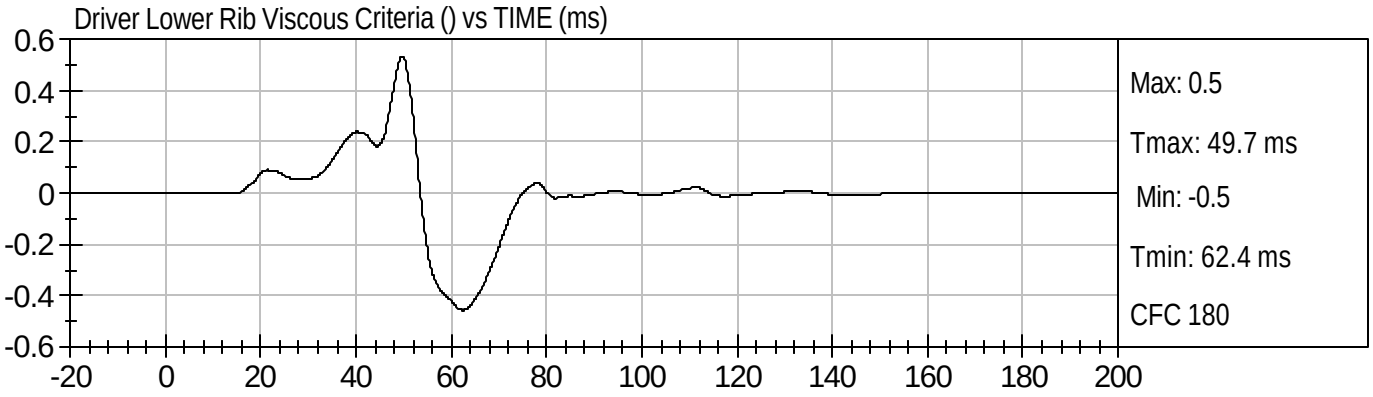


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

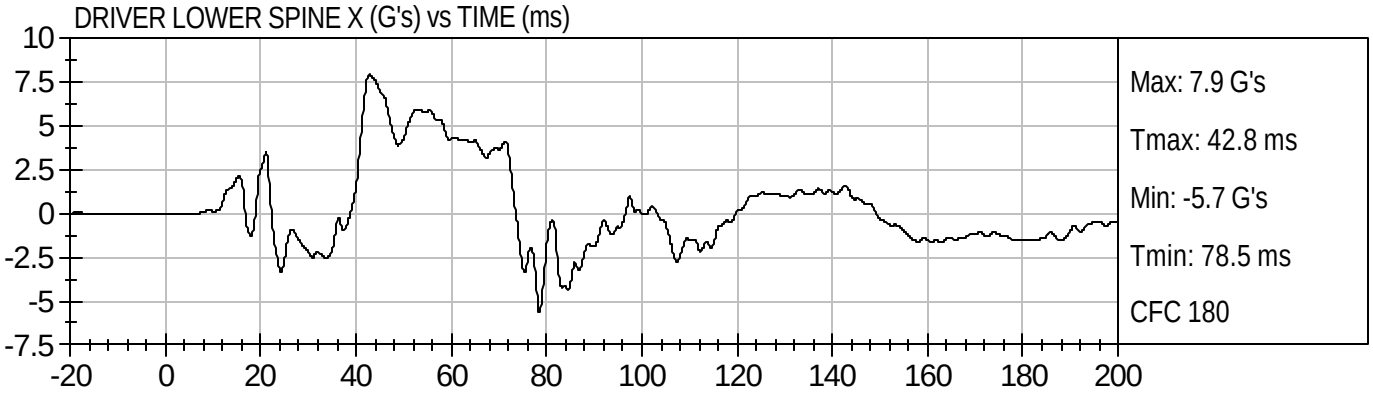


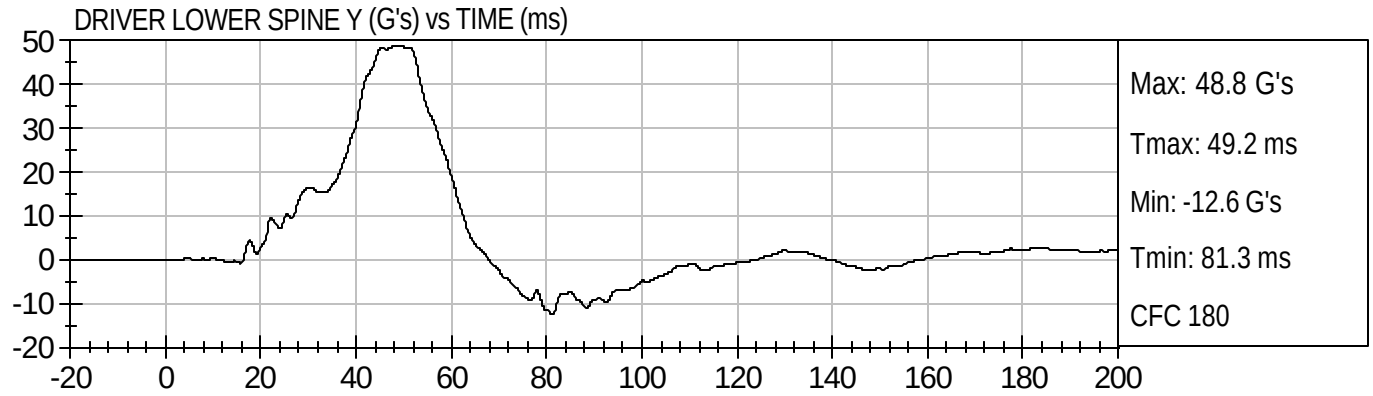


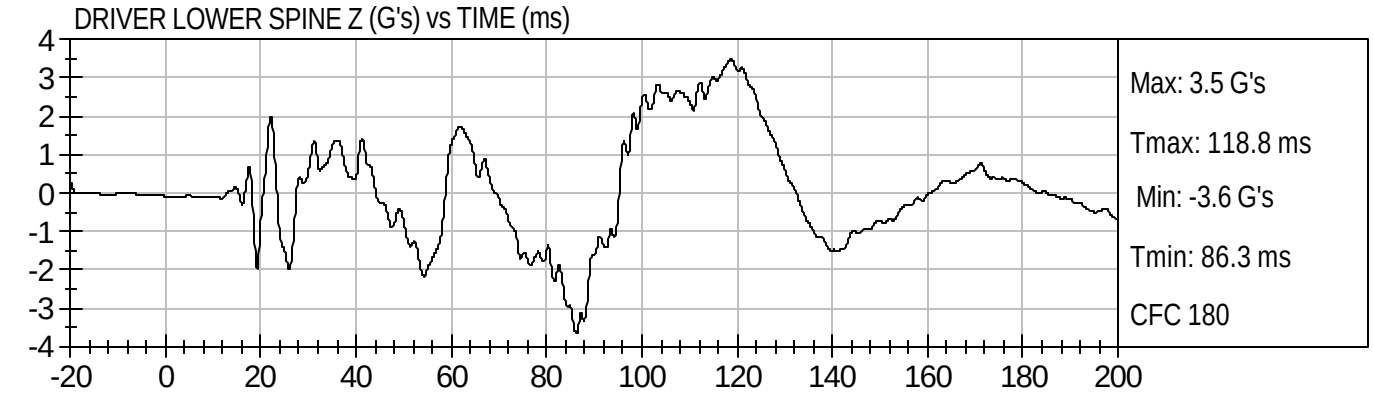


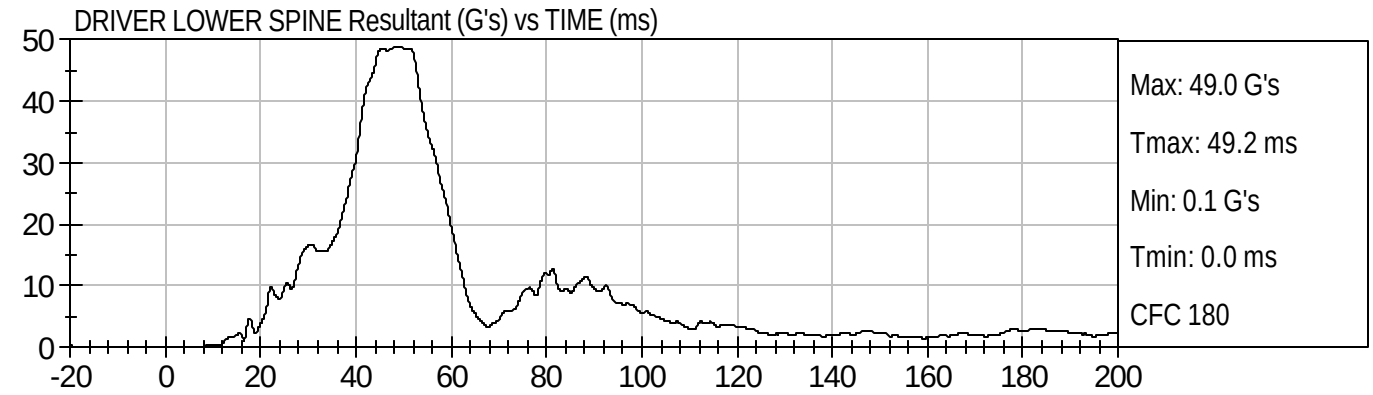
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



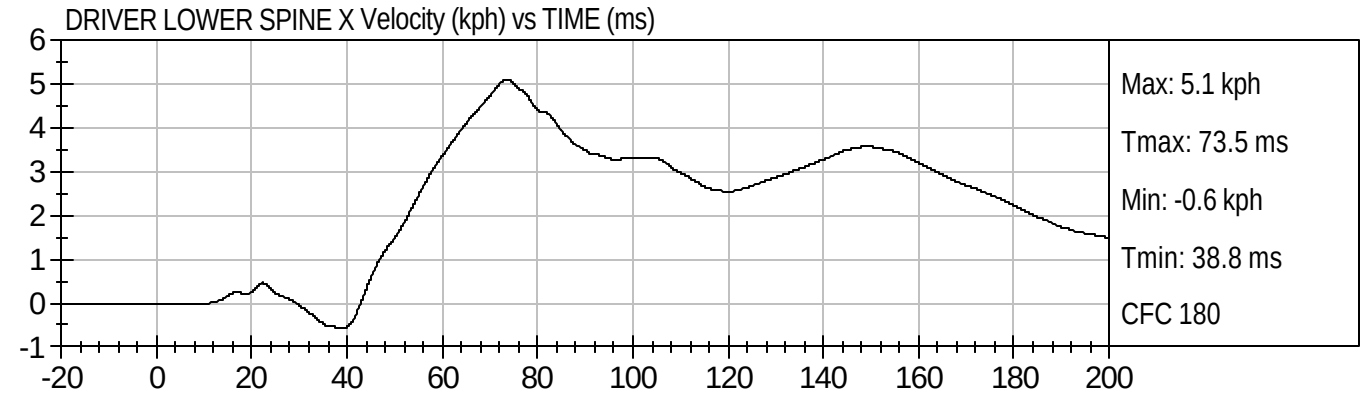


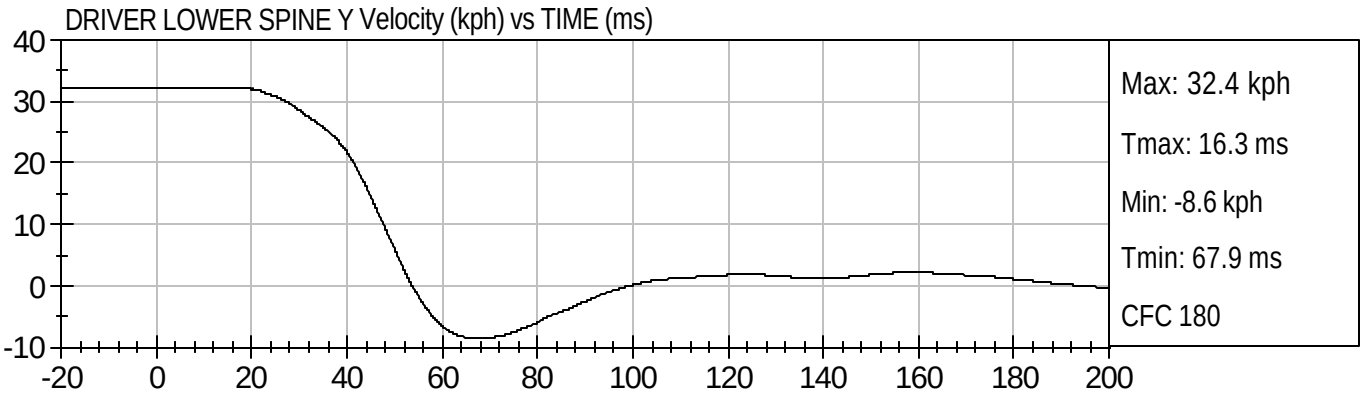


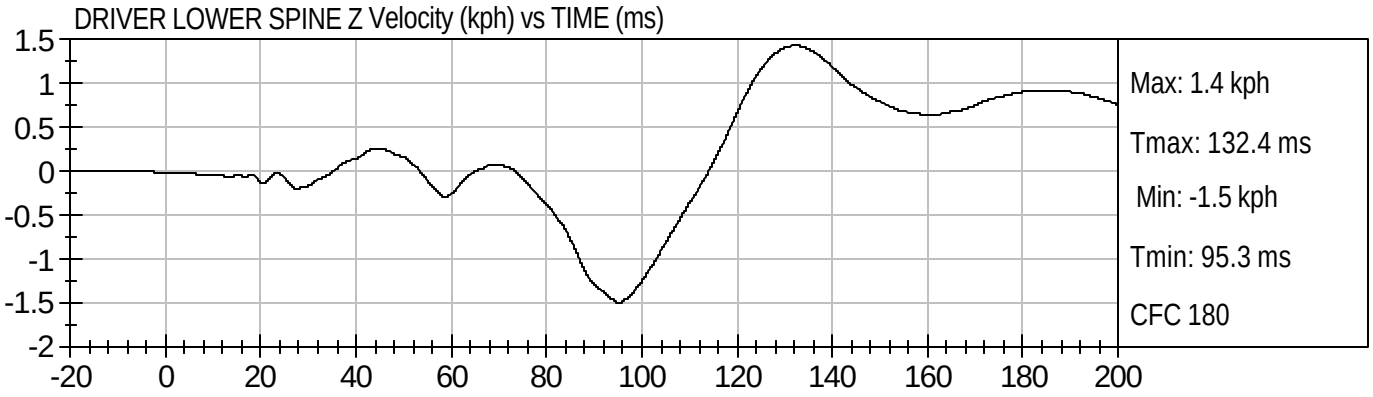


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

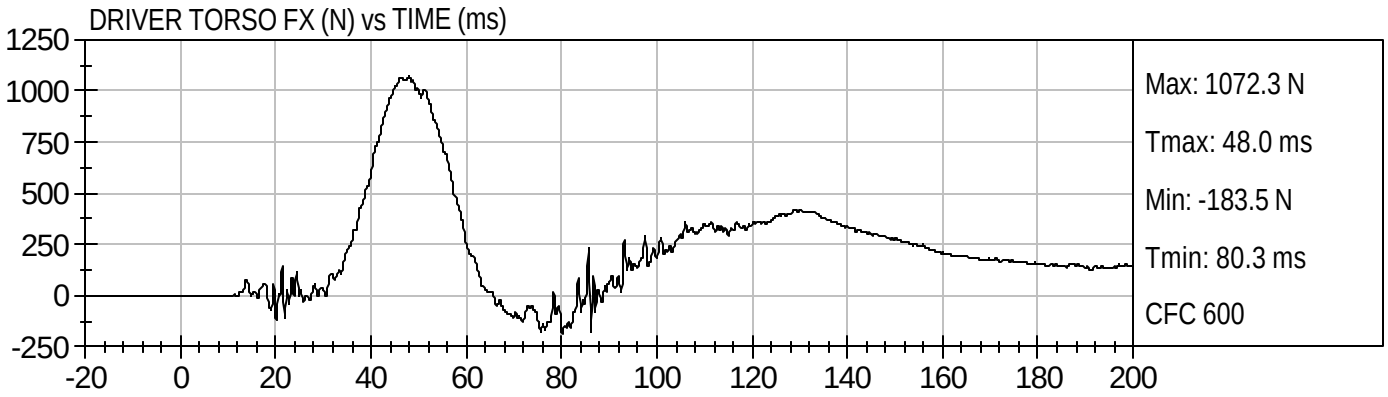


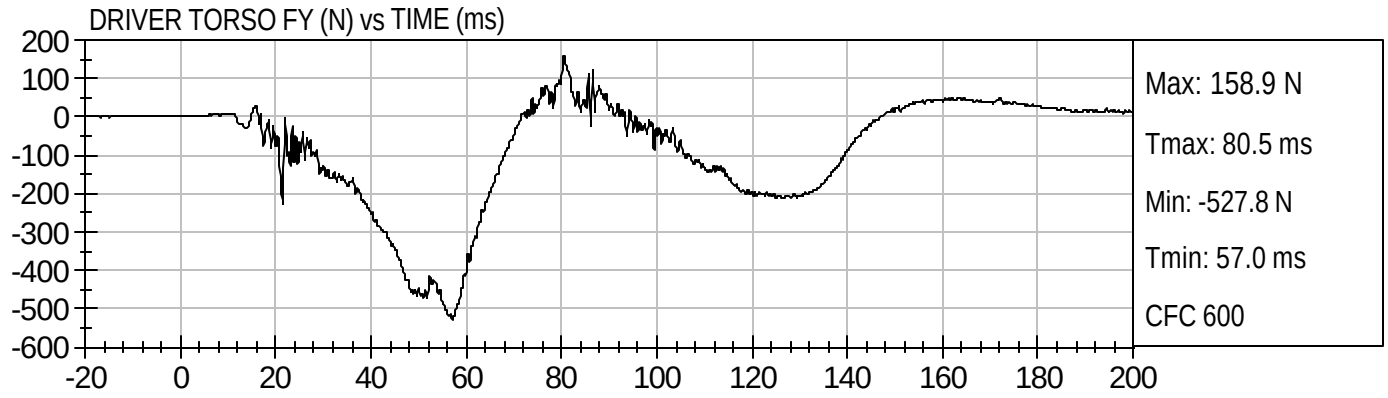


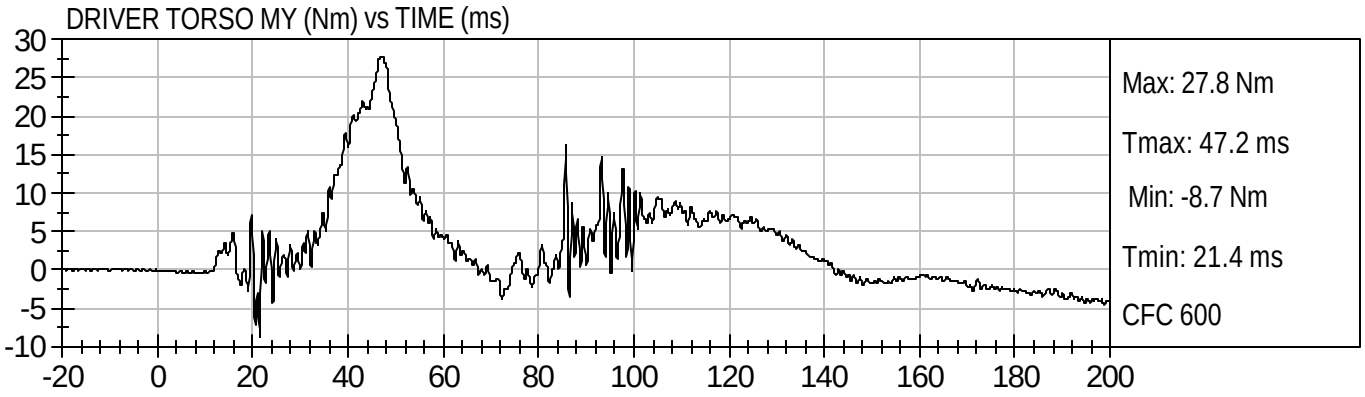


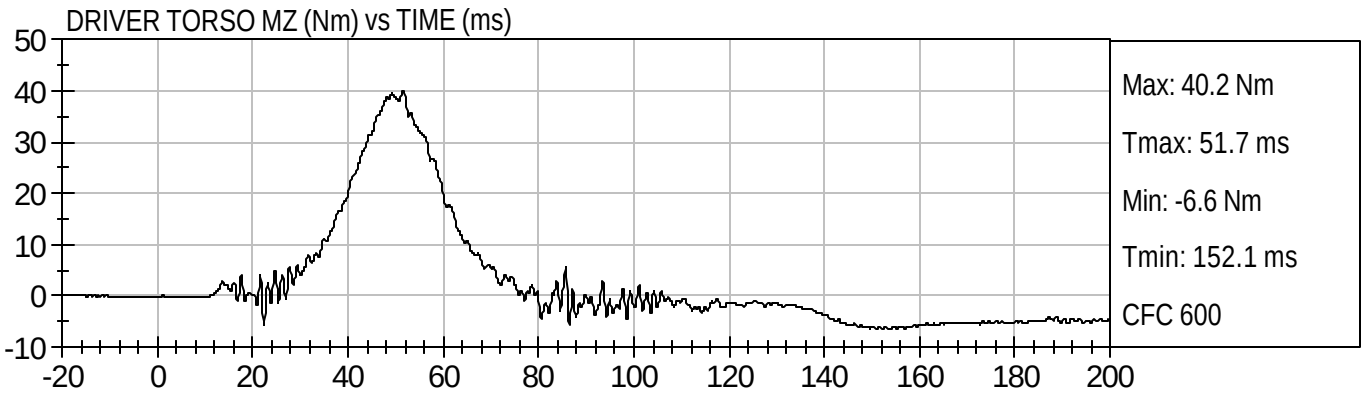
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



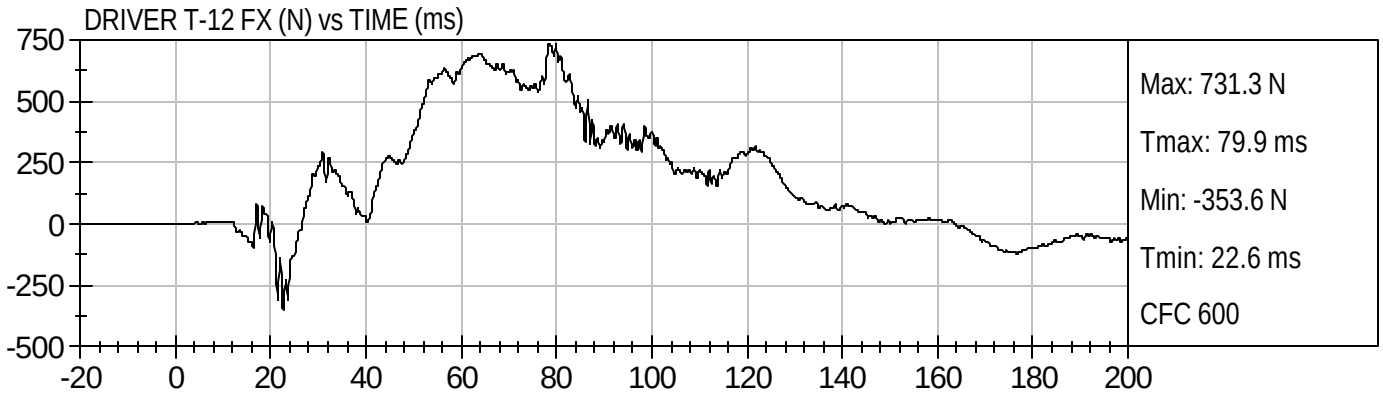


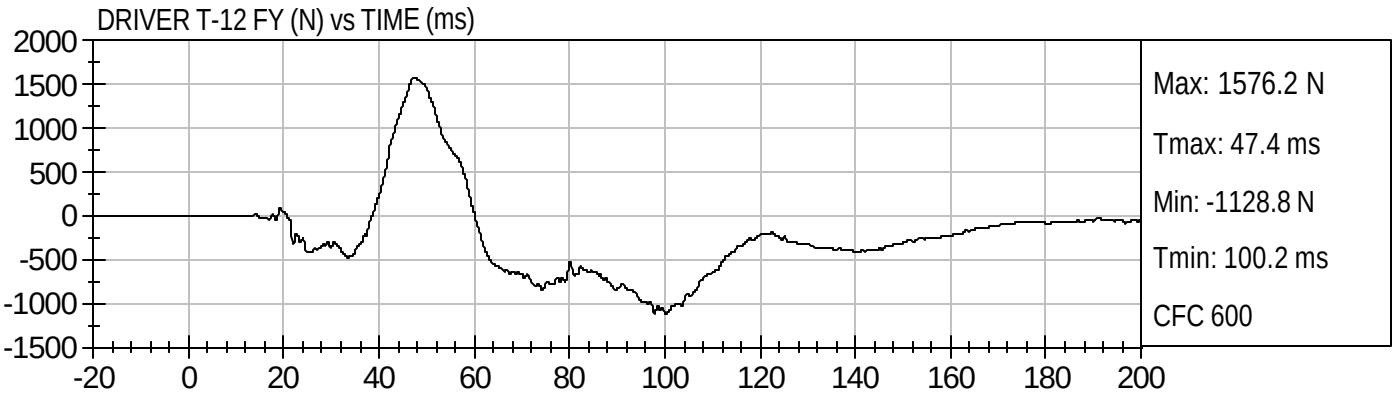


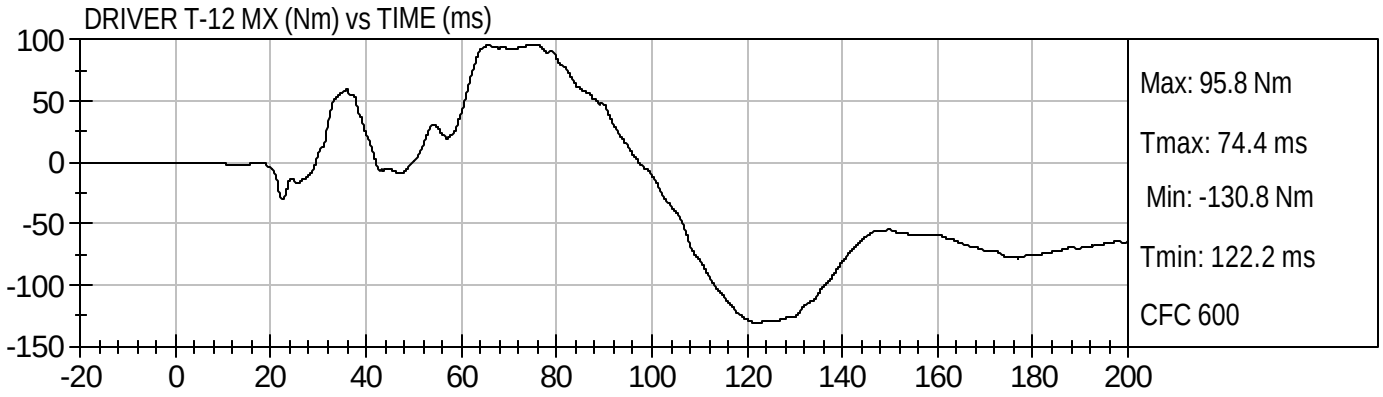


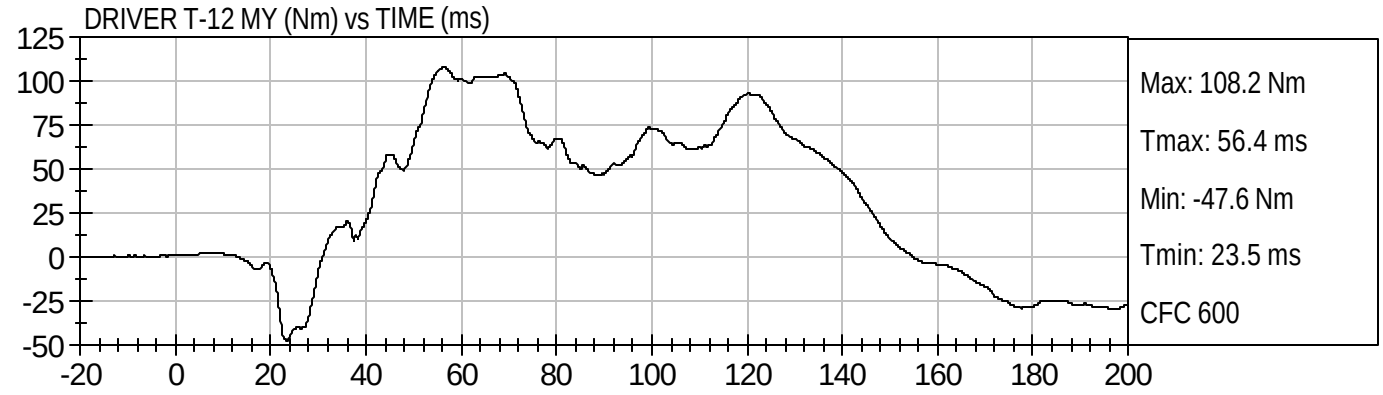
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



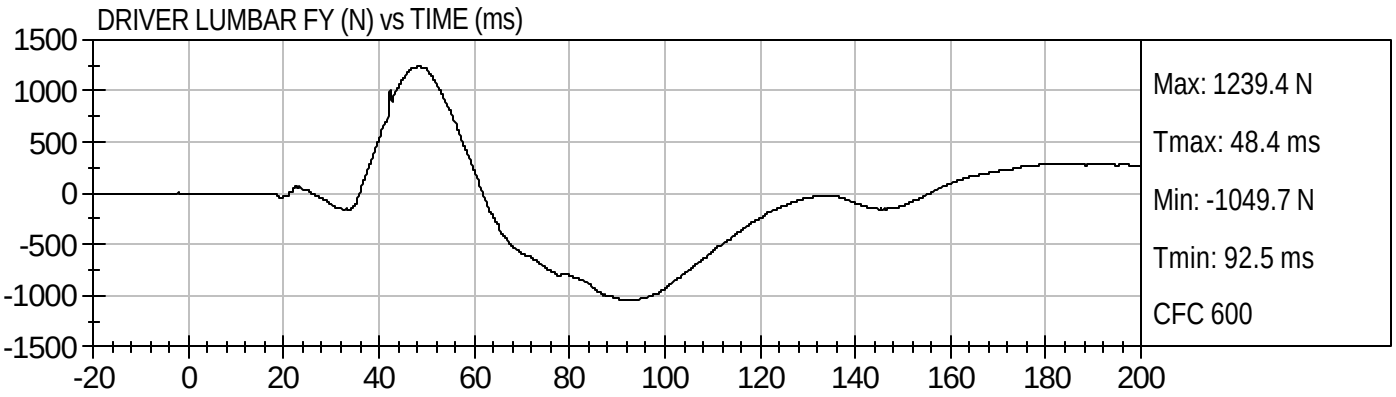


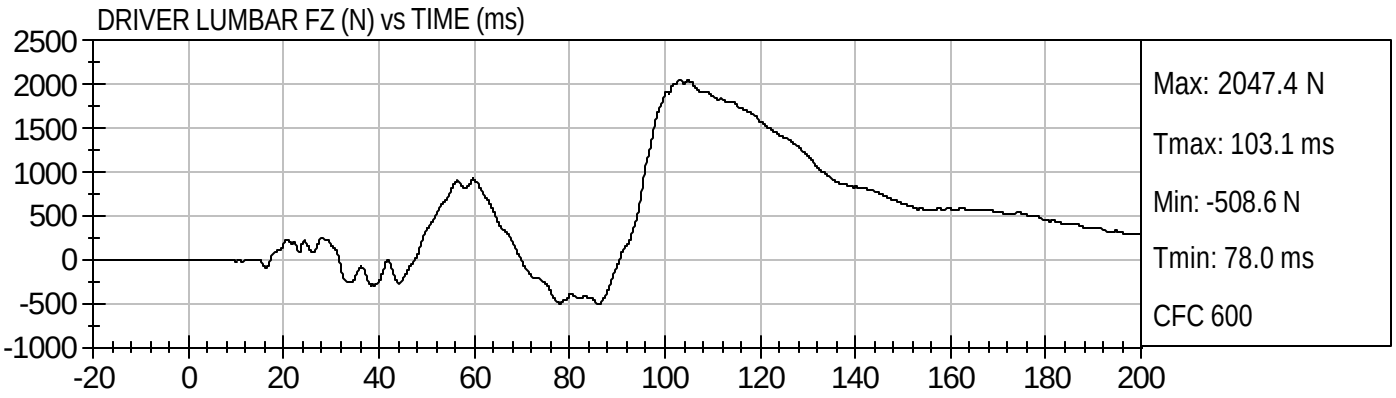


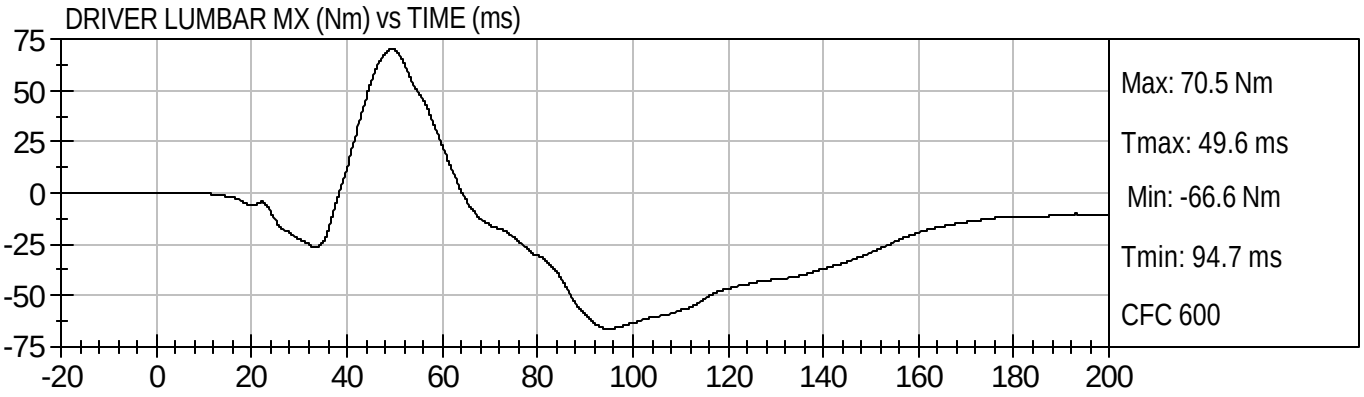


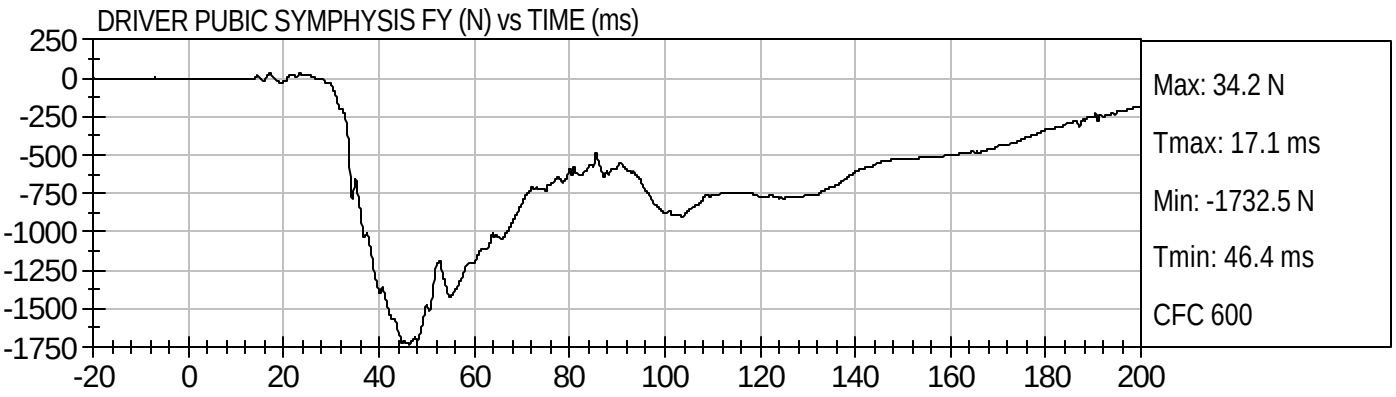
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)





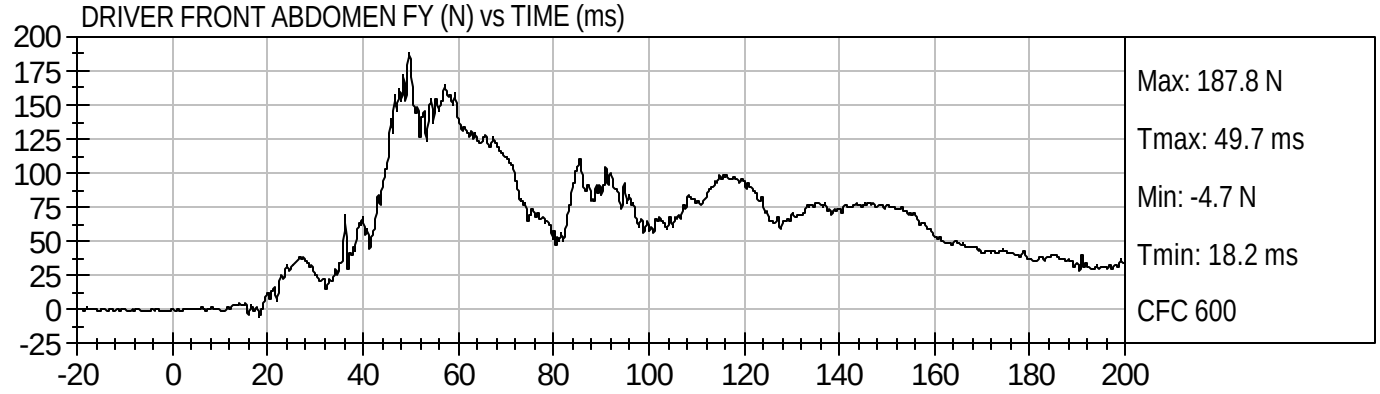




OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

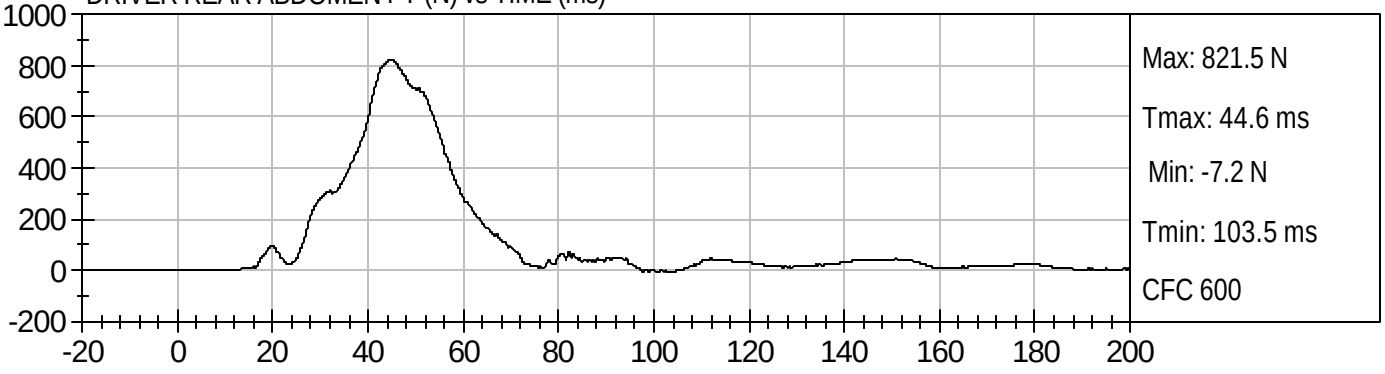
Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

DRIVER FRONT ABDOMEN FY (N) vs TIME (ms)

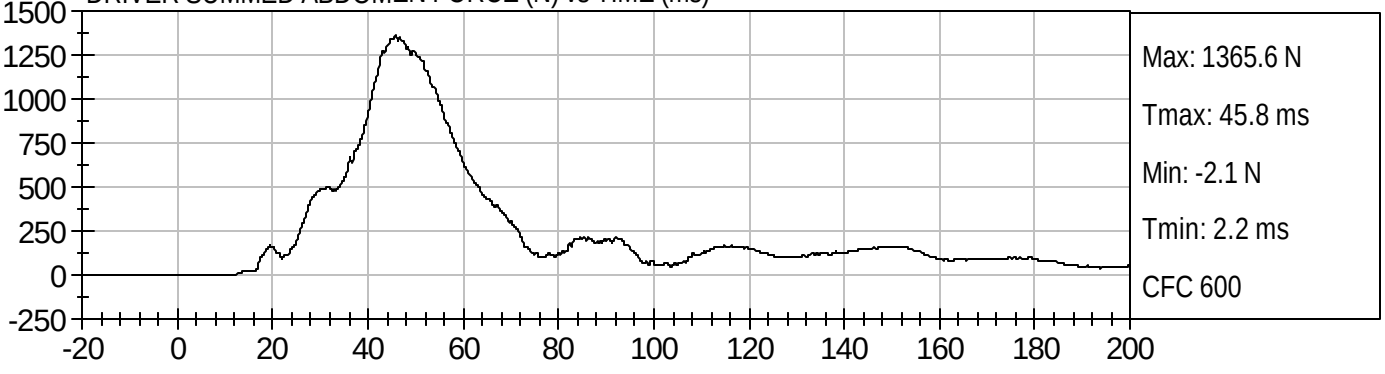


DRIVER MID ABDOMEN FY (N) vs TIME (ms)

DRIVER REAR ABDOMEN FY (N) vs TIME (ms)

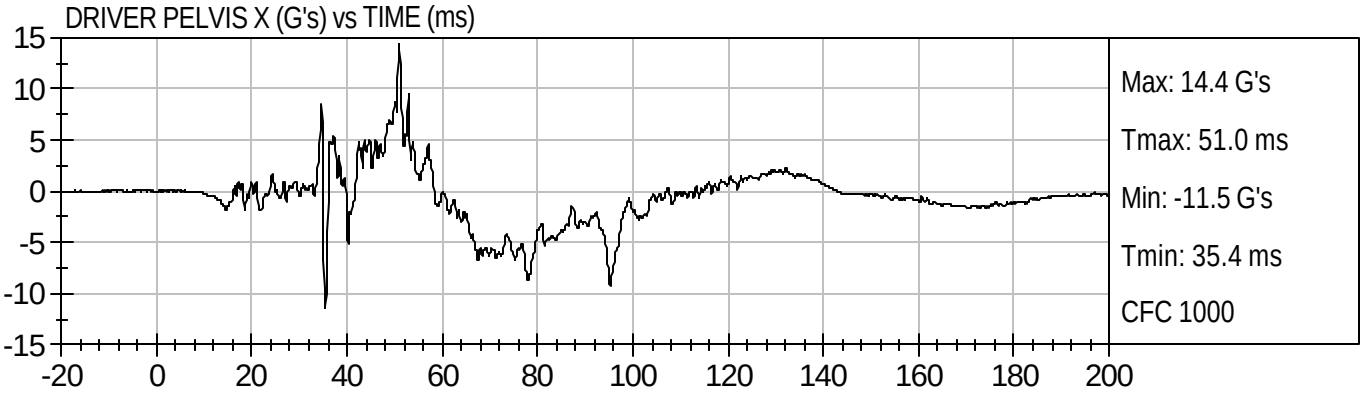


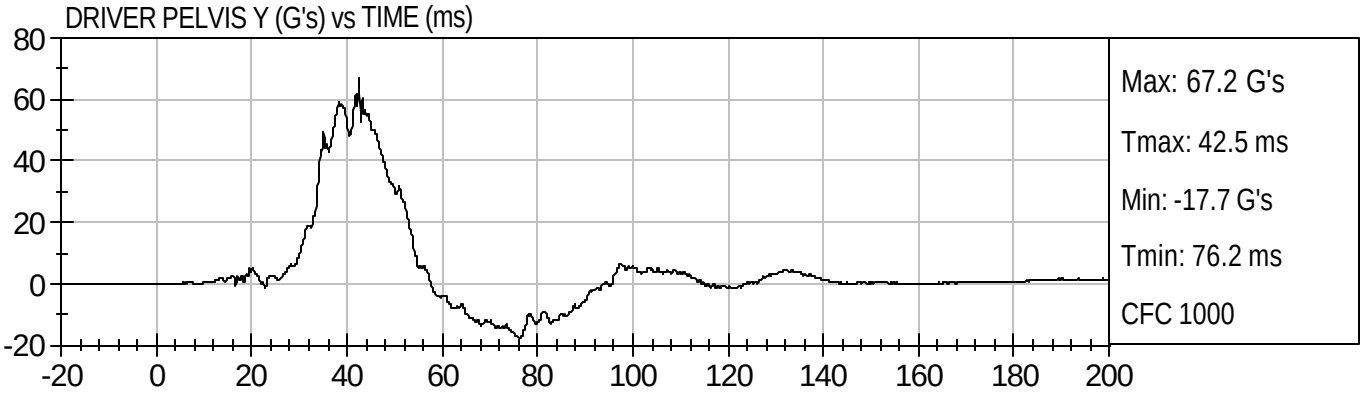
DRIVER SUMMED ABDOMEN FORCE (N) vs TIME (ms)

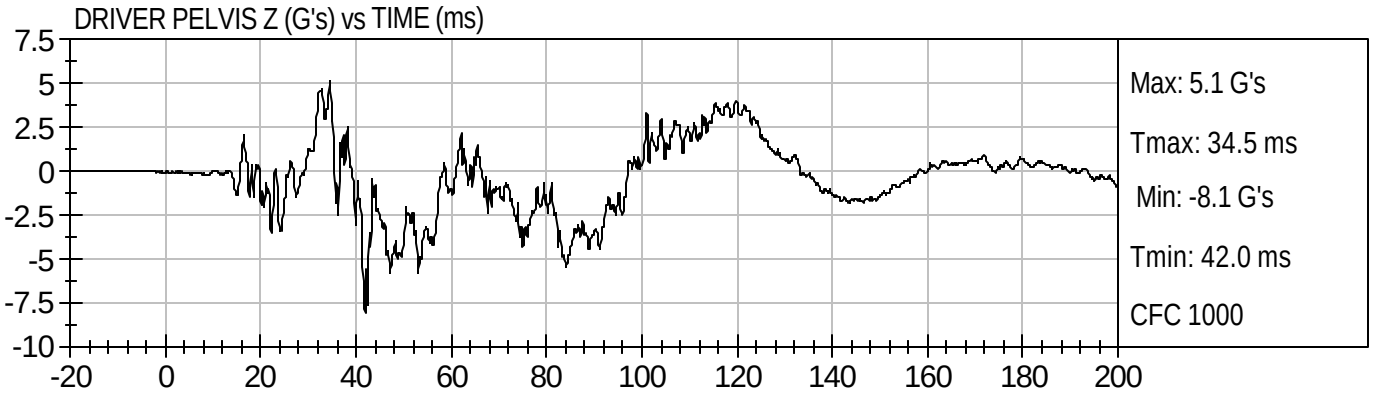


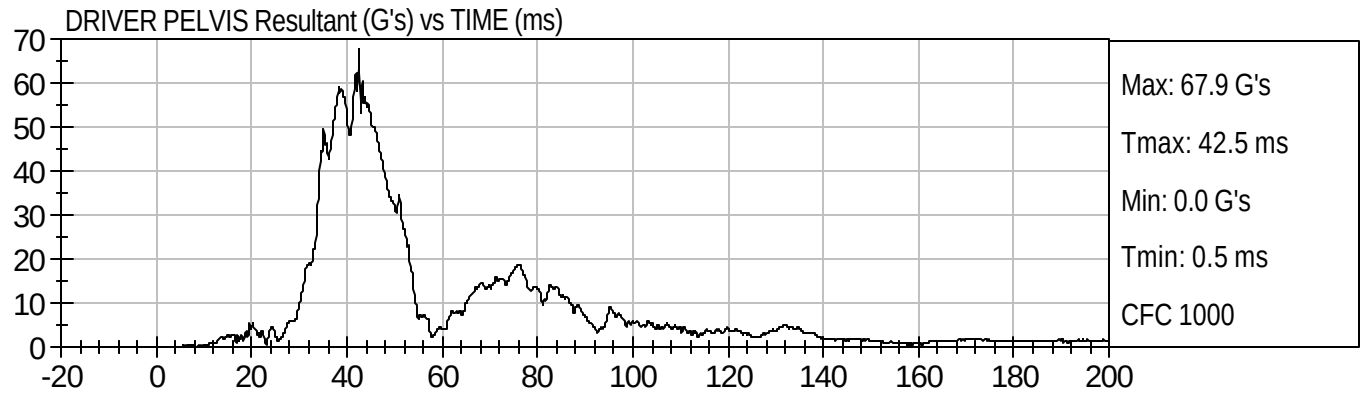
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

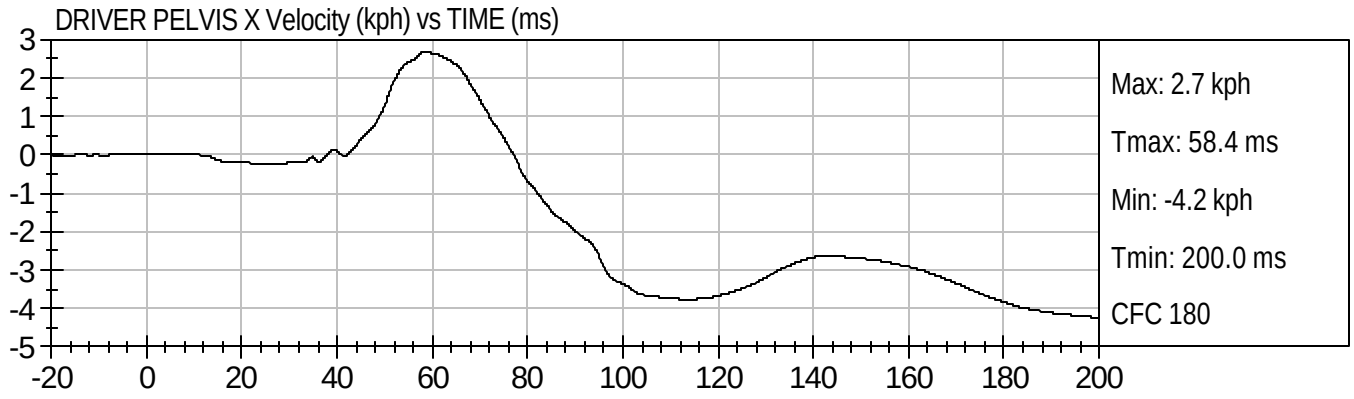
Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

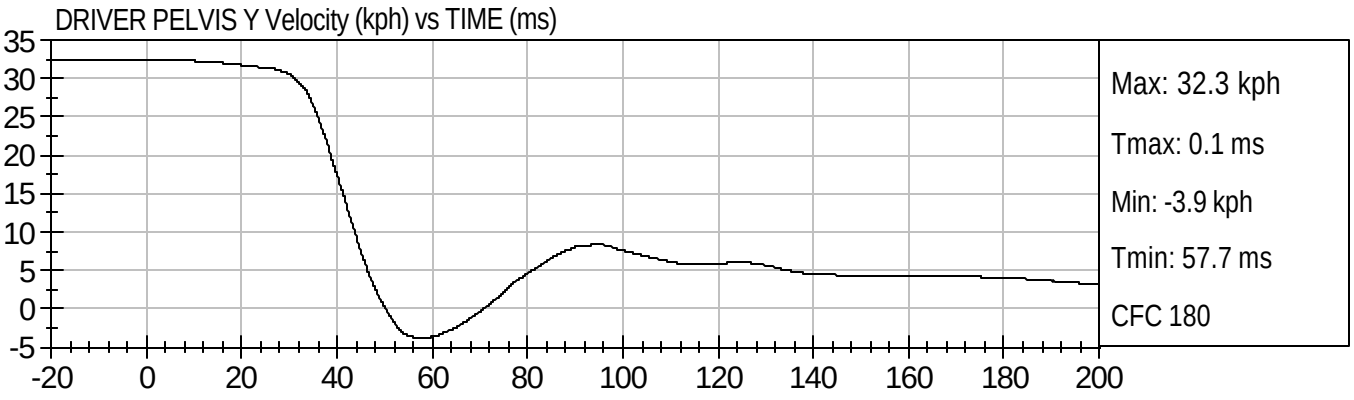


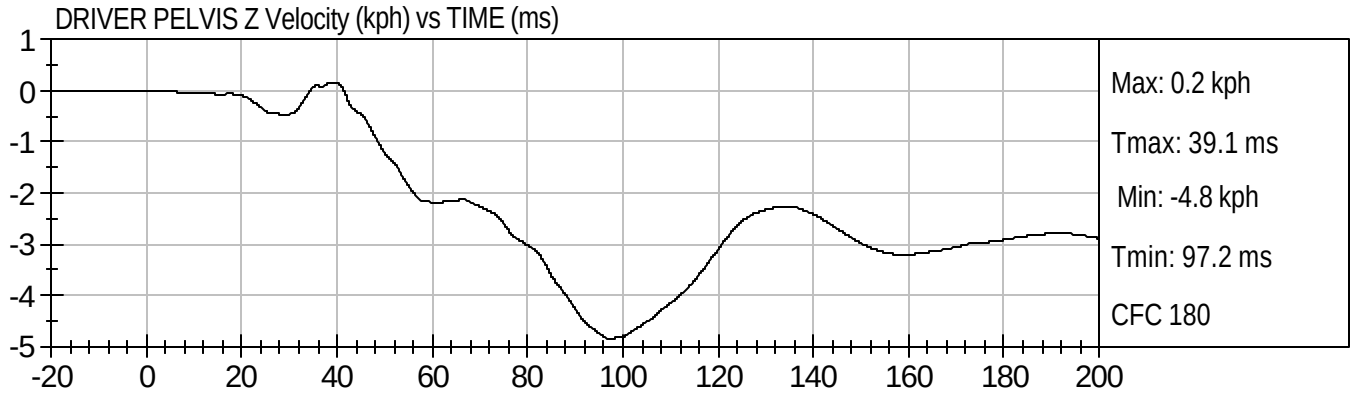






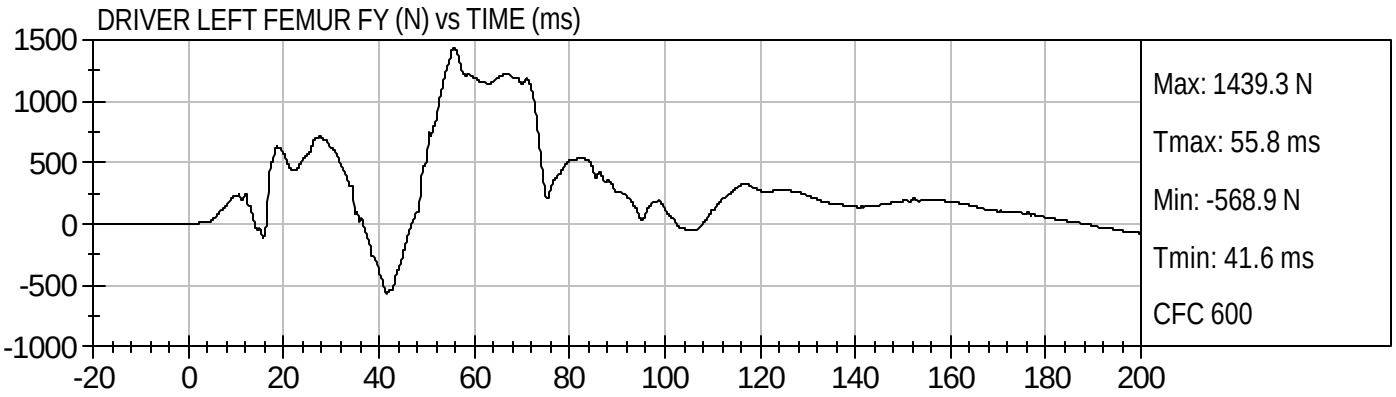

DRIVER PELVIS X Velocity (kph) vs TIME (ms)
3
2
1
0
-1
-2
-3
-4
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 2.7 kph
Tmax: 58.4 ms
Min: -4.2 kph
Tmin: 200.0 ms
CFC 180

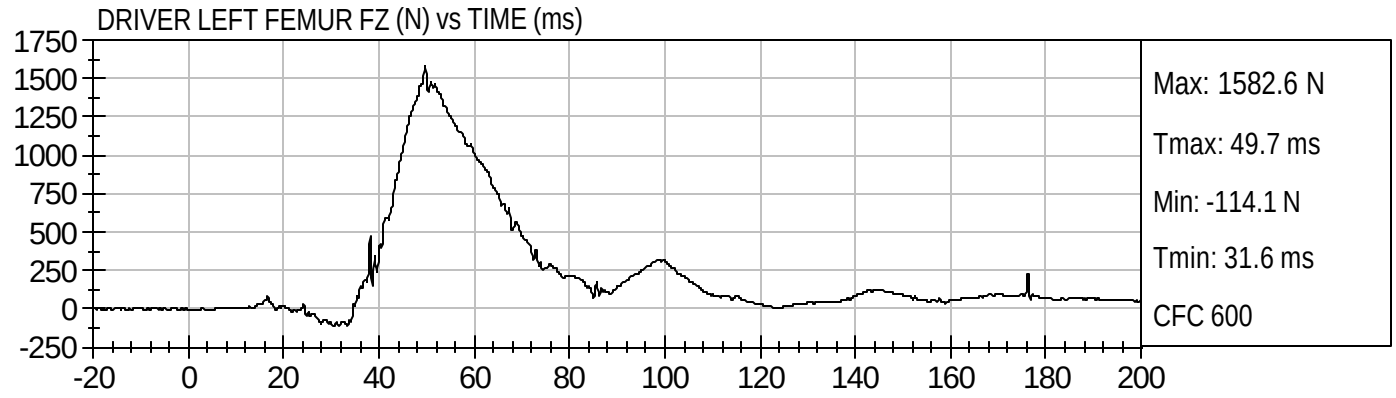

DRIVER PELVIS Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.3 kph
Tmax: 0.1 ms
Min: -3.9 kph
Tmin: 57.7 ms
CFC 180


DRIVER PELVIS Z Velocity (kph) vs TIME (ms)
1
0
-1
-2
-3
-4
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.2 kph
Tmax: 39.1 ms
Min: -4.8 kph
Tmin: 97.2 ms
CFC 180

OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

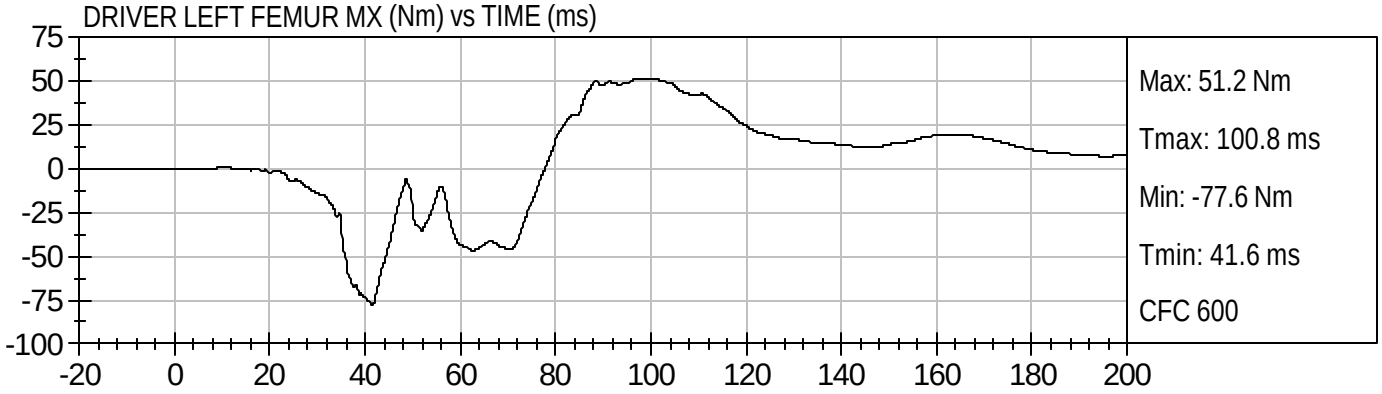




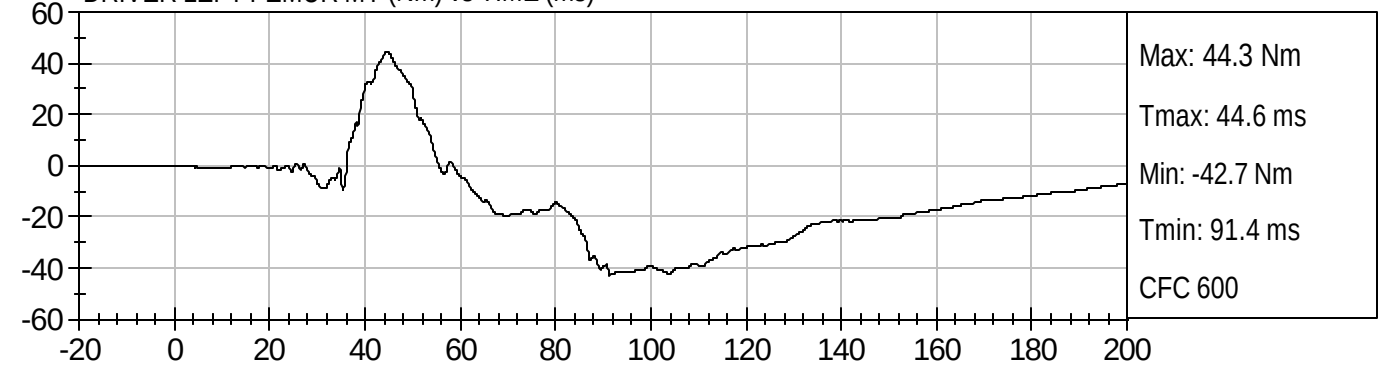
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

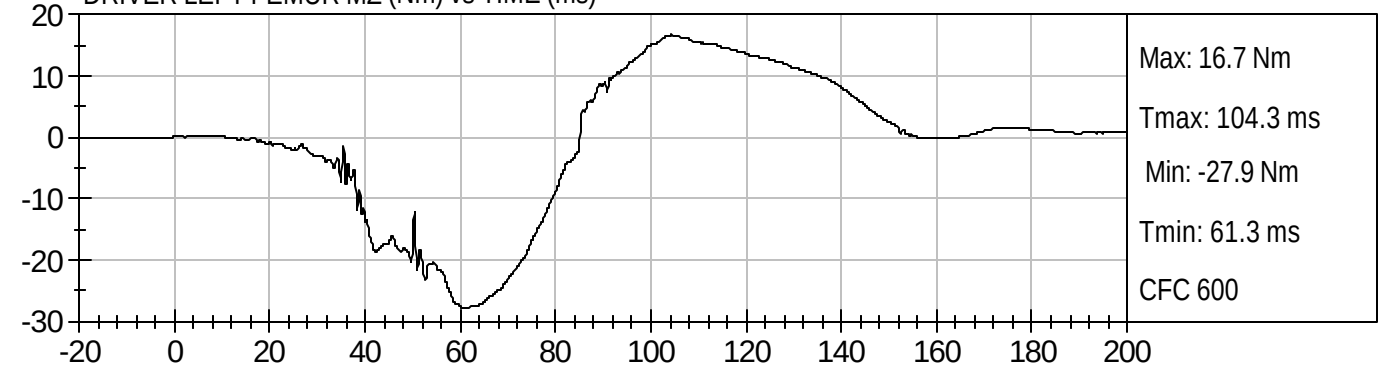
DRIVER LEFT FEMUR MX (Nm) vs TIME (ms)



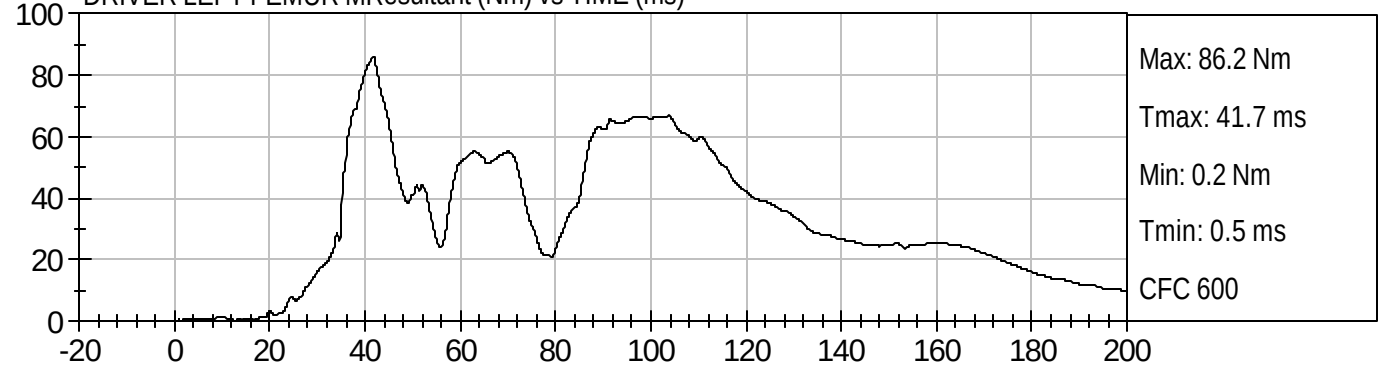
DRIVER LEFT FEMUR MY (Nm) vs TIME (ms)



DRIVER LEFT FEMUR MZ (Nm) vs TIME (ms)

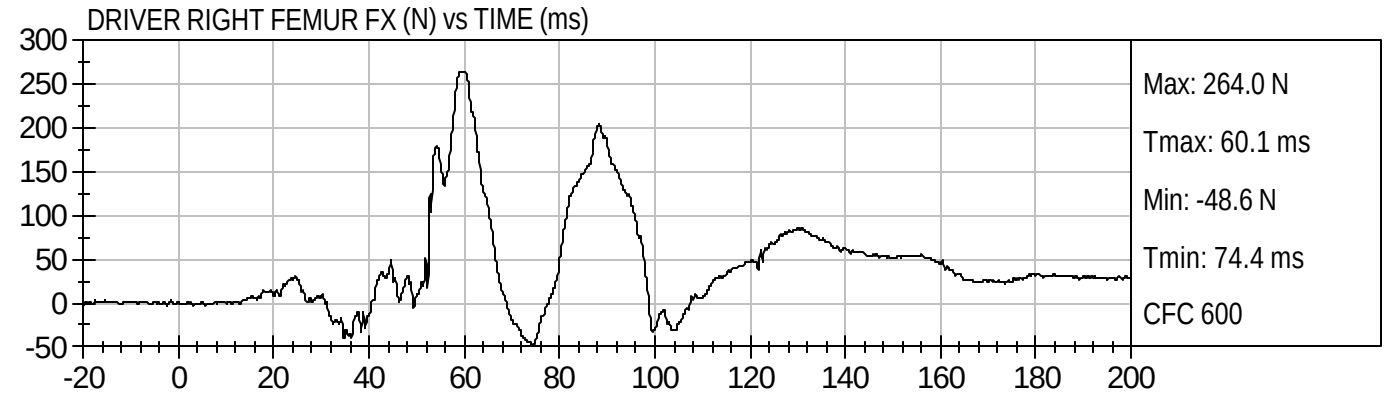


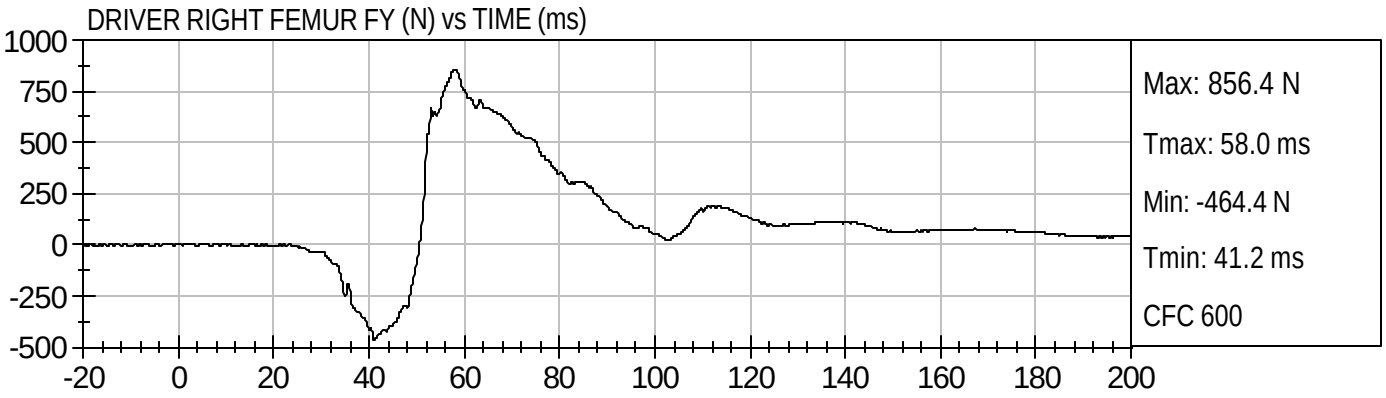
DRIVER LEFT FEMUR MResultant (Nm) vs TIME (ms)

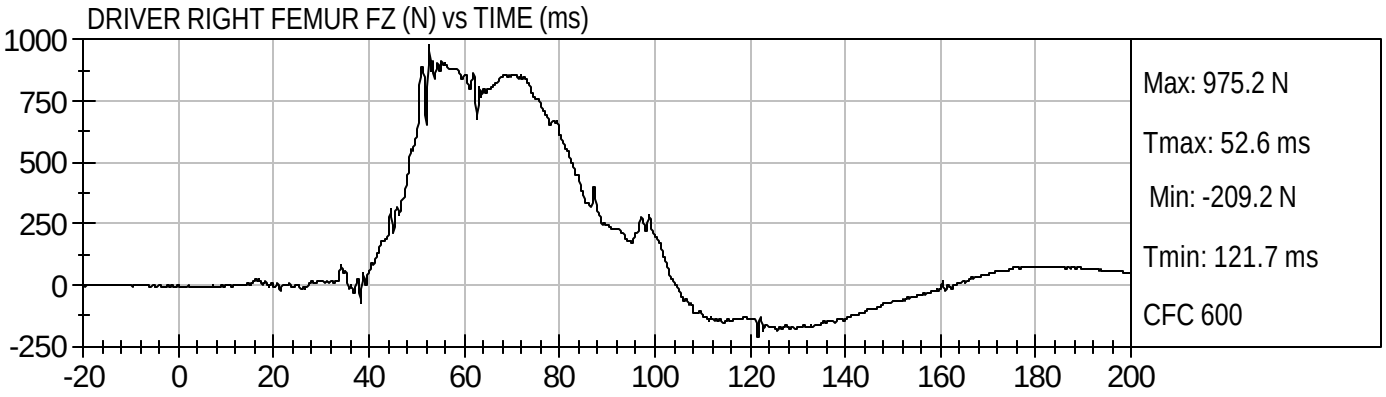


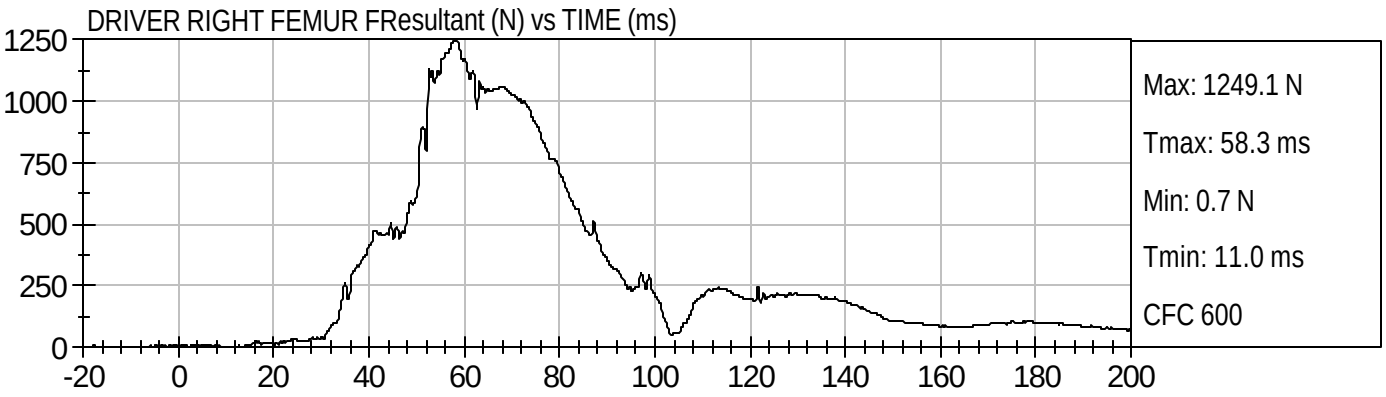
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



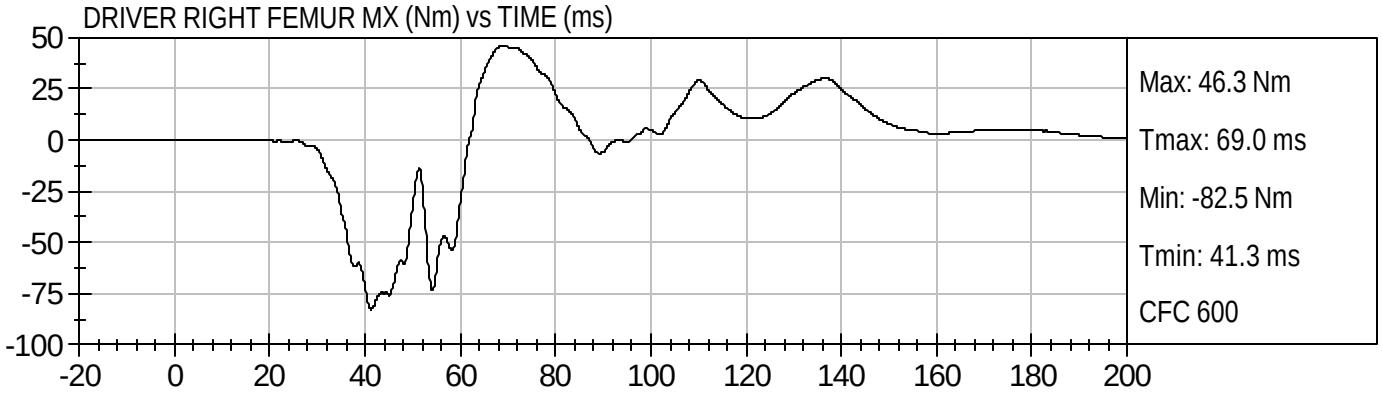


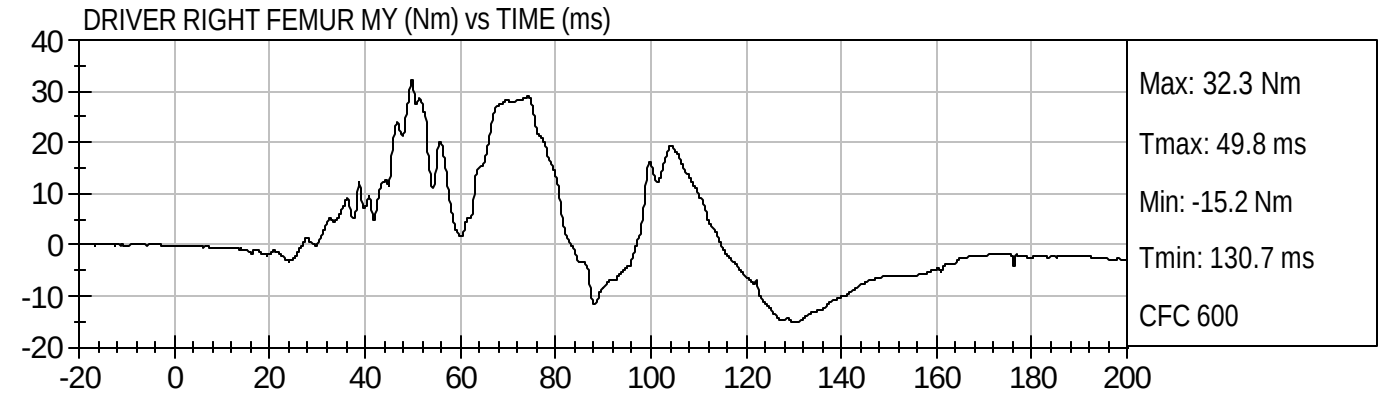


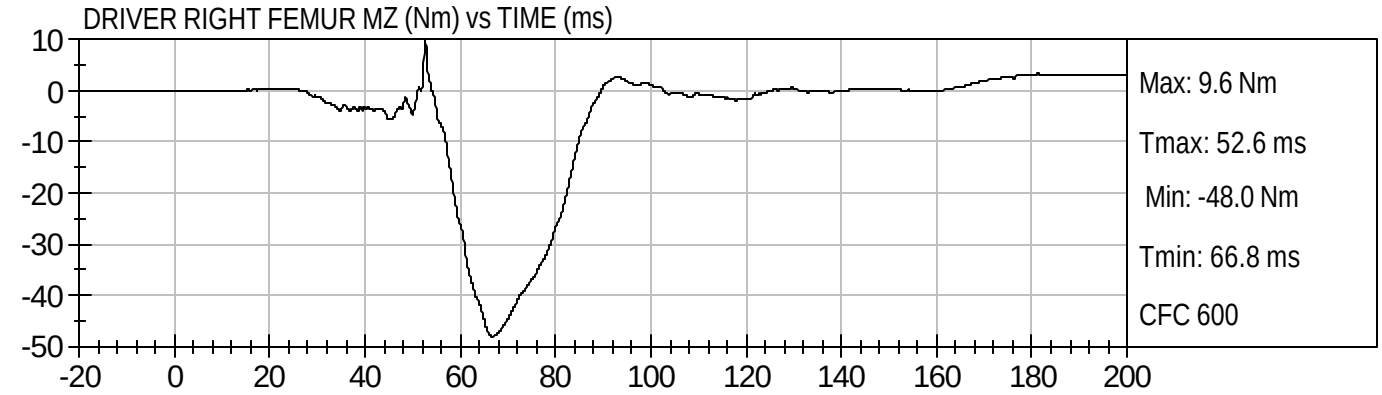


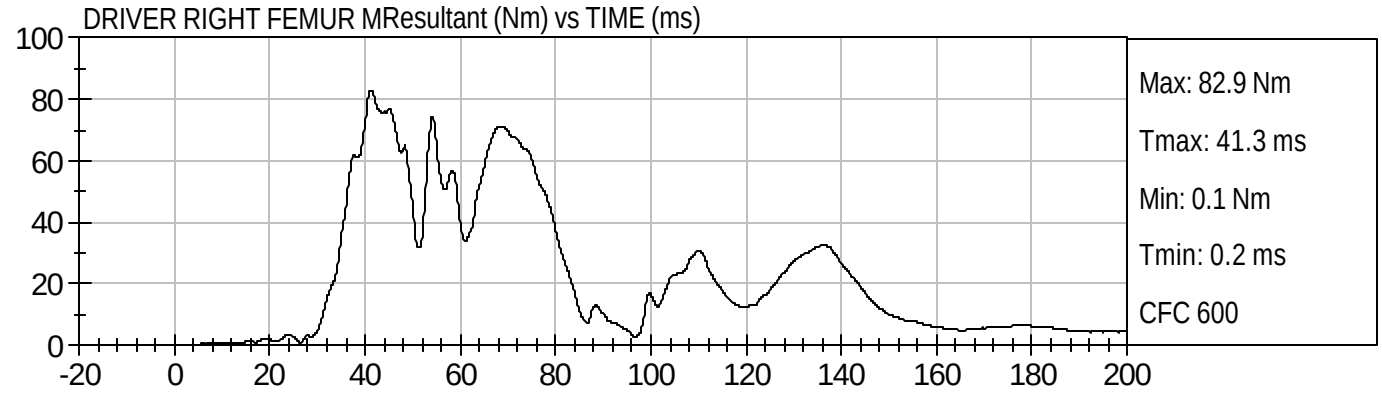
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)





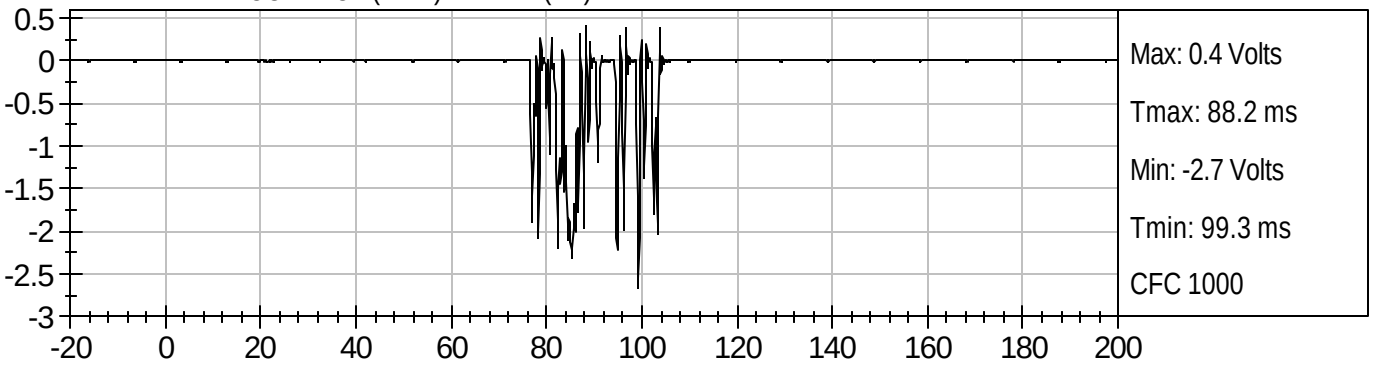




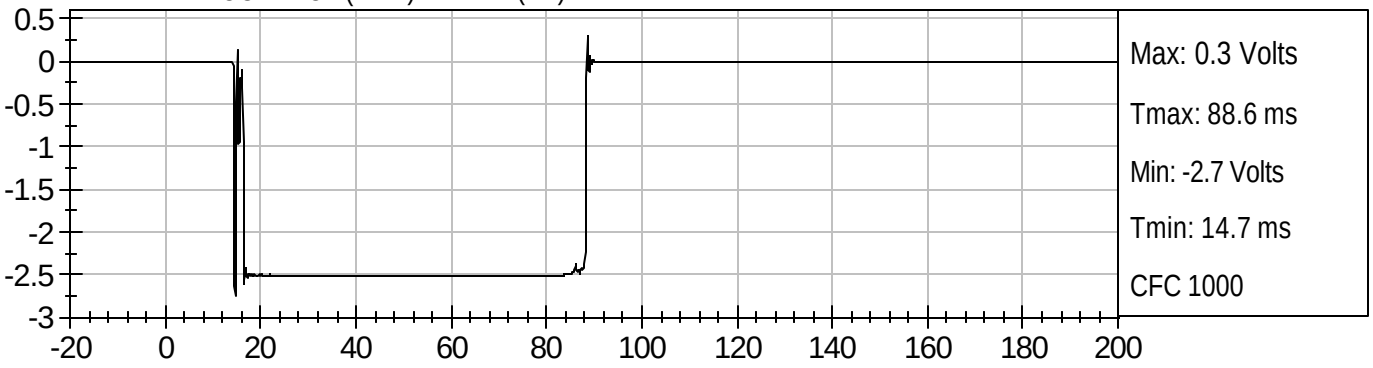
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

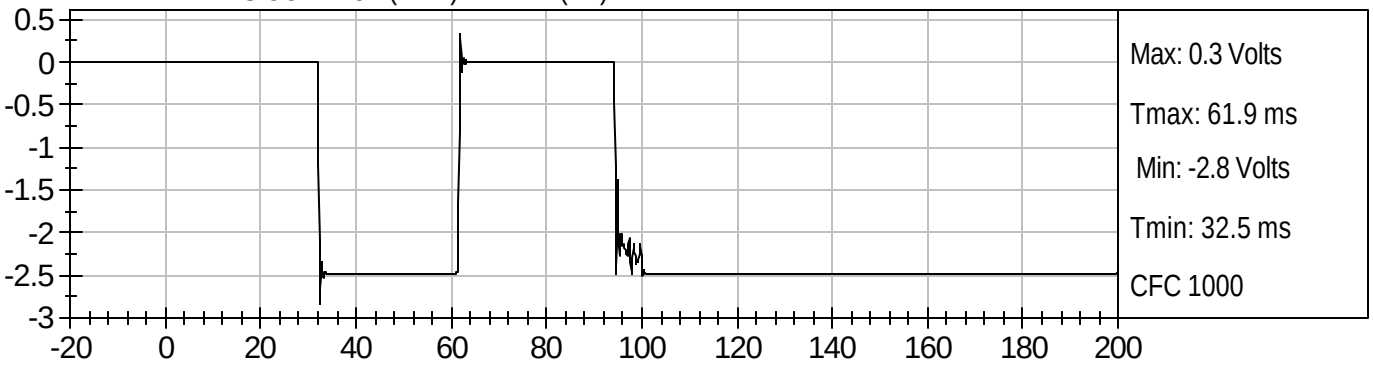
DRIVER HEAD CONTACT (Volts) vs TIME (ms)



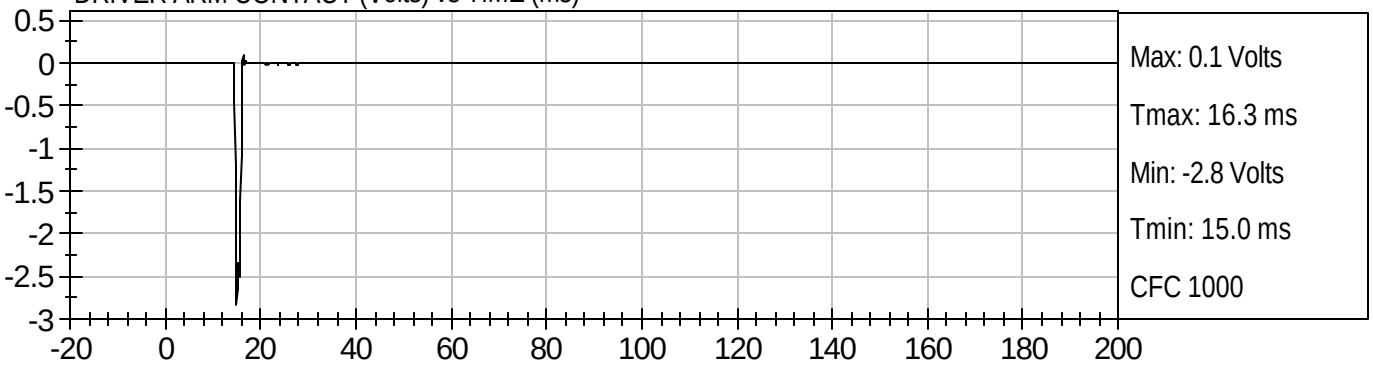
DRIVER RIB CONTACT (Volts) vs TIME (ms)



DRIVER PELVIS CONTACT (Volts) vs TIME (ms)

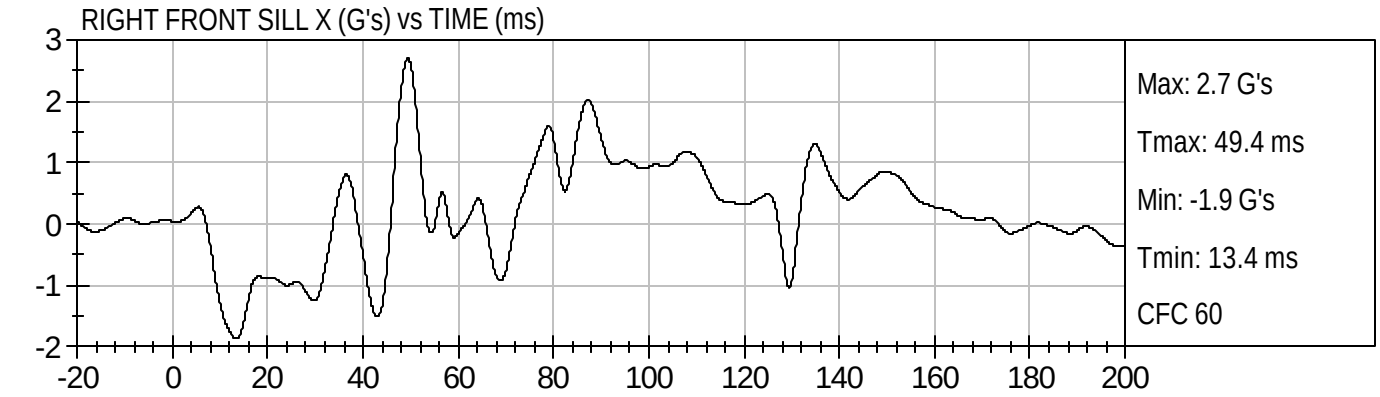


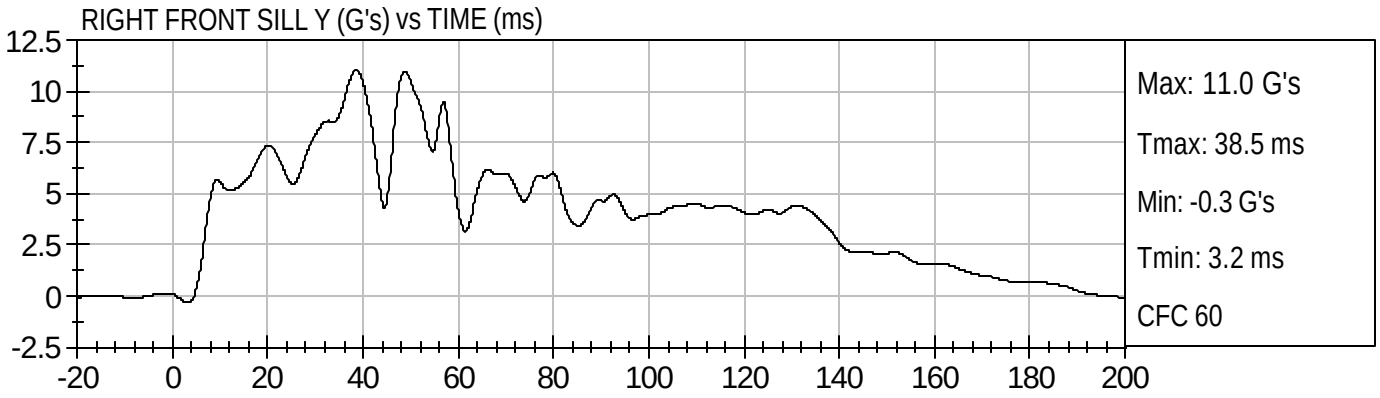
DRIVER ARM CONTACT (Volts) vs TIME (ms)

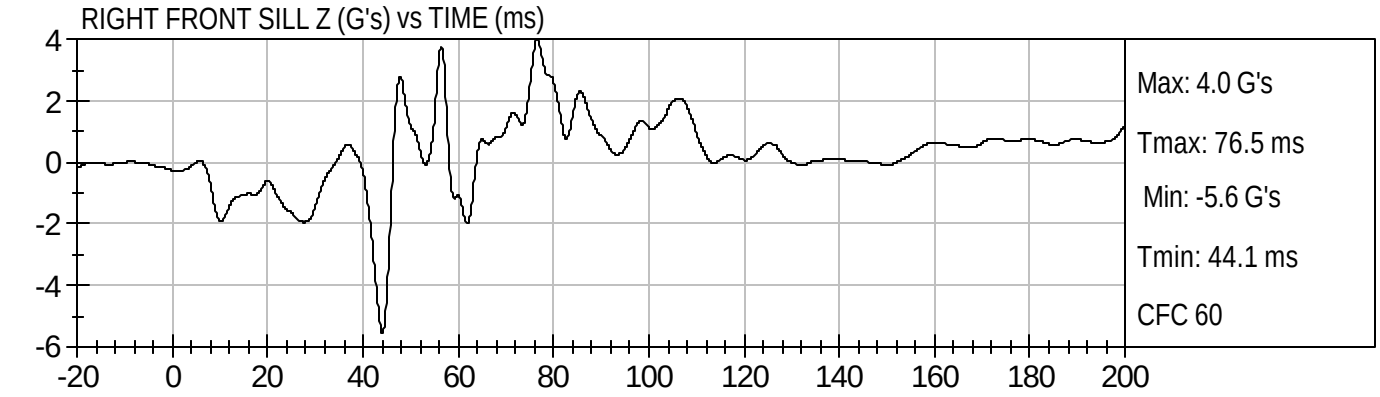


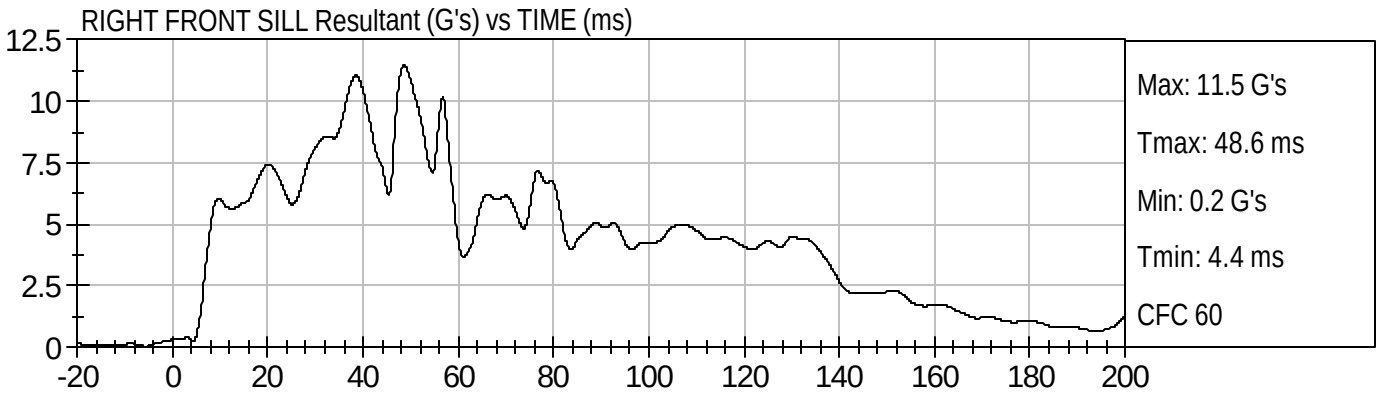
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

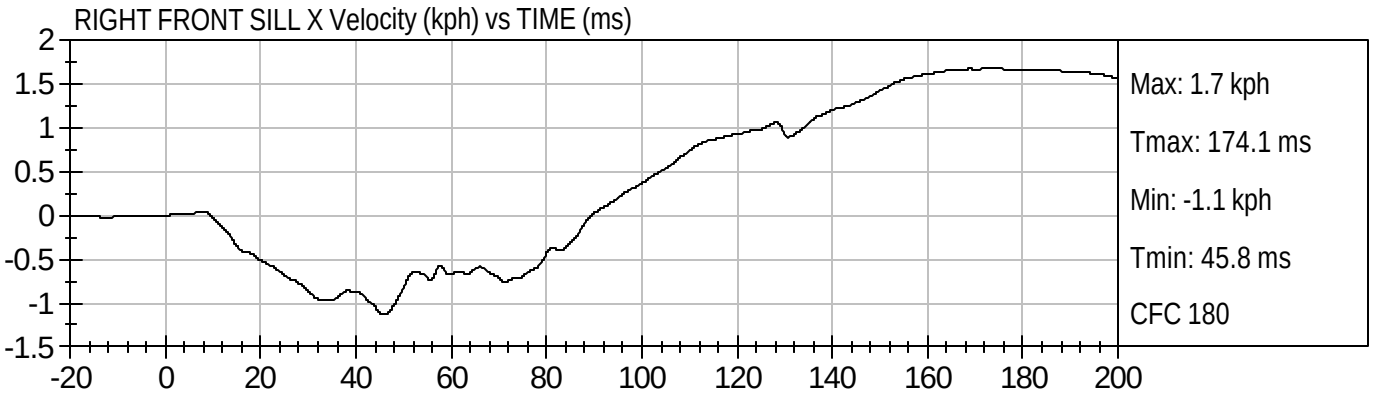
Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

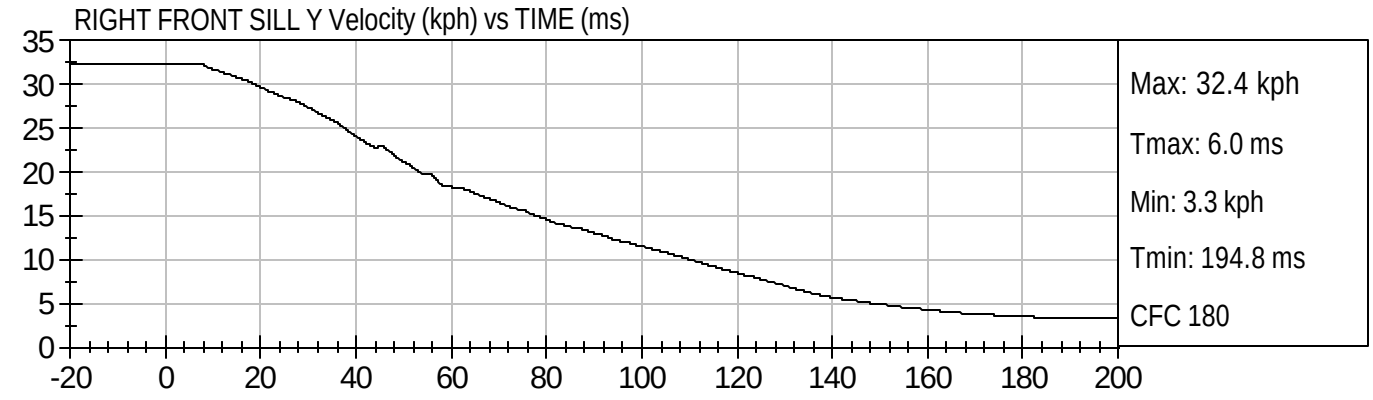


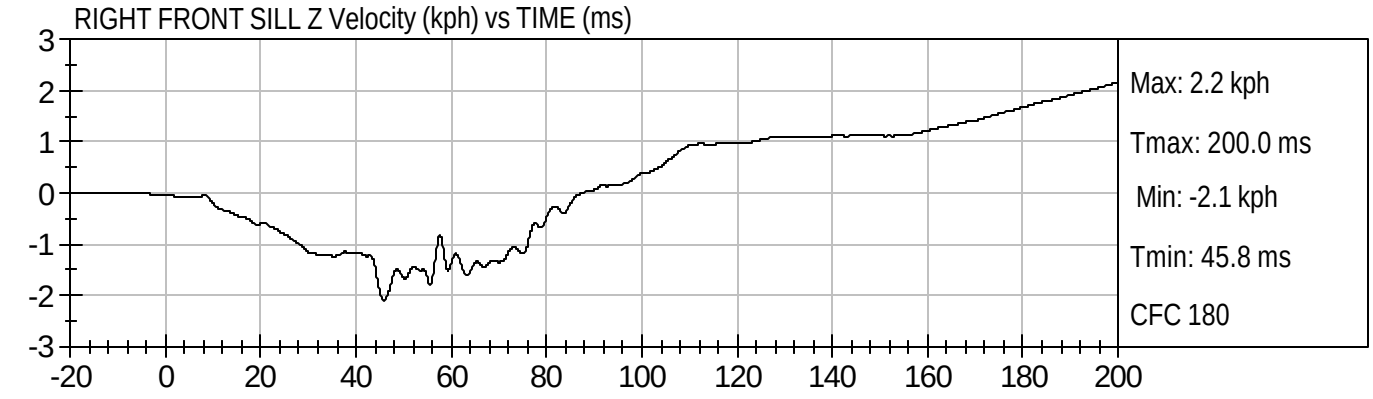






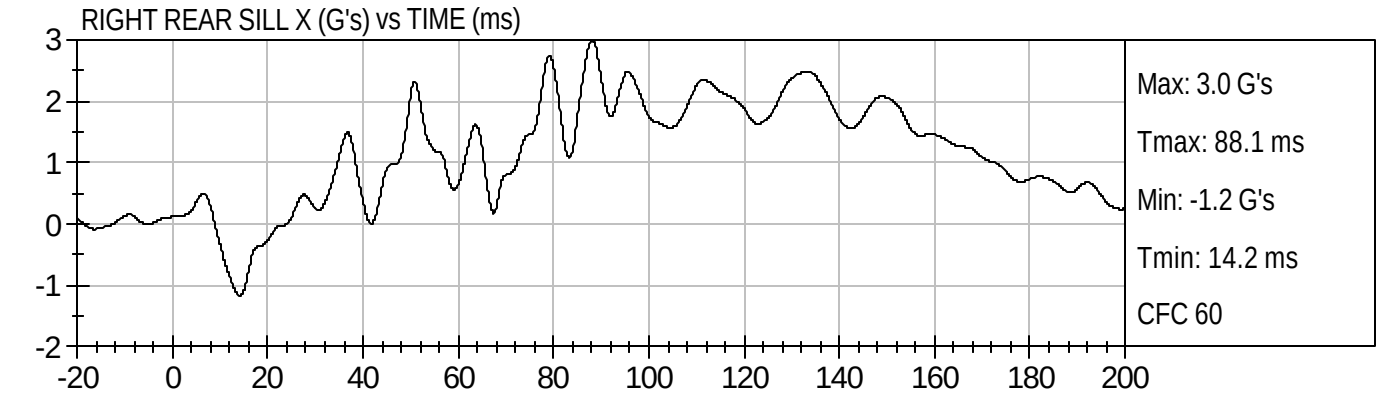

RIGHT FRONT SILL X Velocity (kph) vs TIME (ms)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.7 kph
Tmax: 174.1 ms
Min: -1.1 kph
Tmin: 45.8 ms
CFC 180

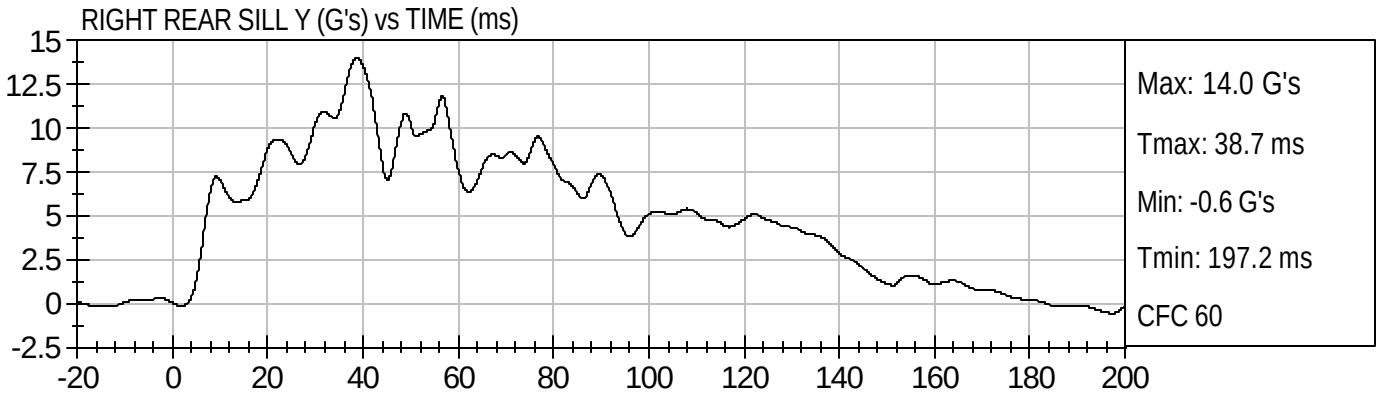

RIGHT FRONT SILL Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.4 kph
Tmax: 6.0 ms
Min: 3.3 kph
Tmin: 194.8 ms
CFC 180

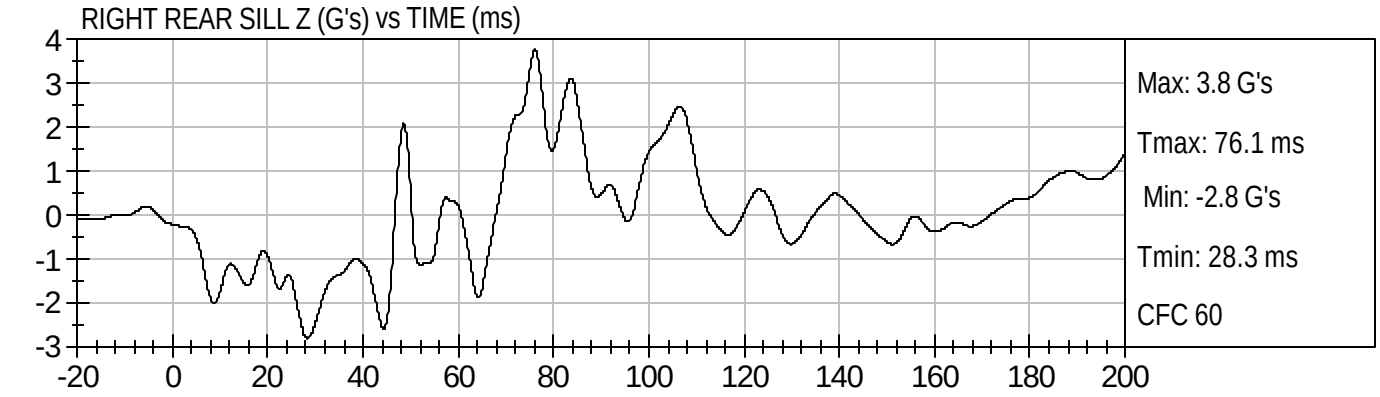

RIGHT FRONT SILL Z Velocity (kph) vs TIME (ms)
3
2
1
0
-1
-2
-3
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 2.2 kph
Tmax: 200.0 ms
Min: -2.1 kph
Tmin: 45.8 ms
CFC 180

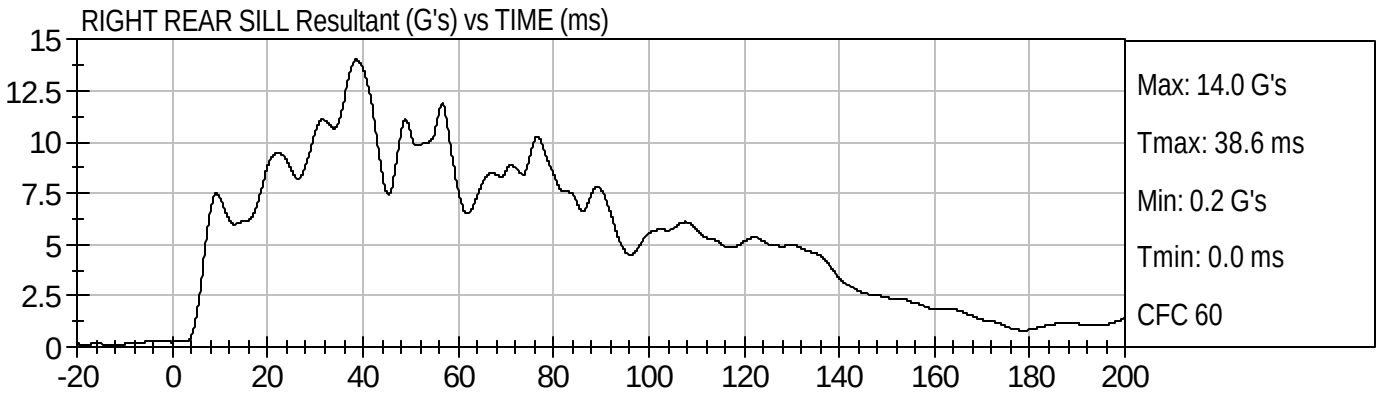
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

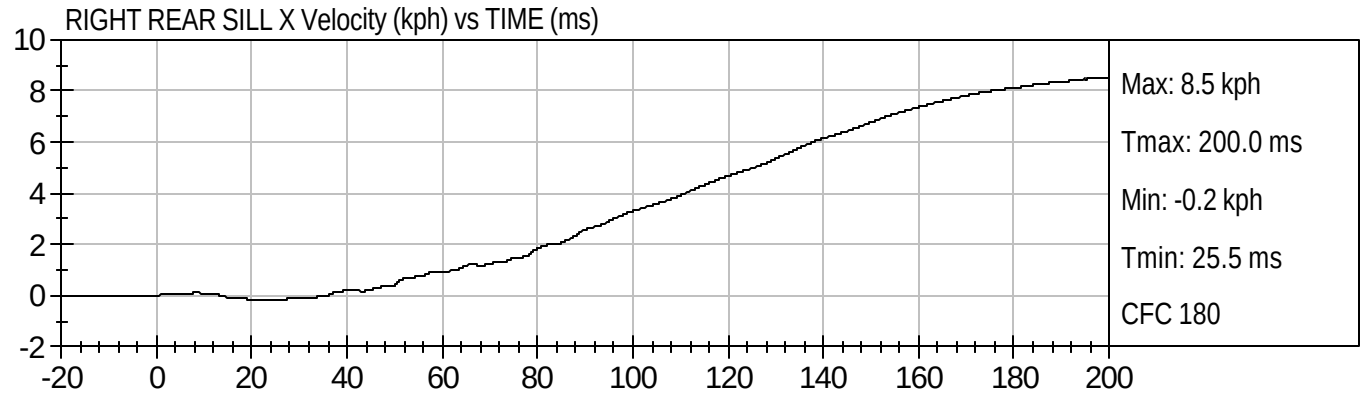
Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

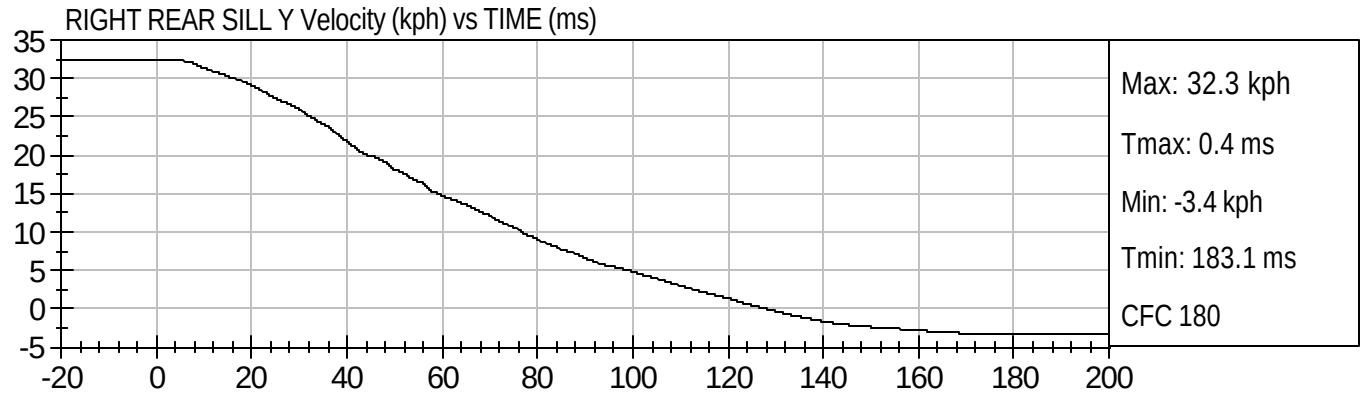


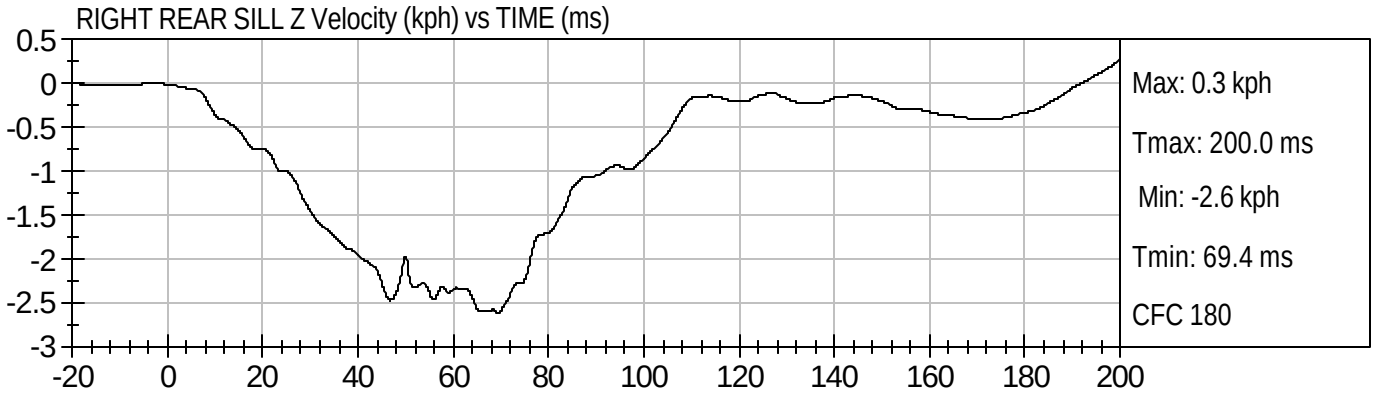






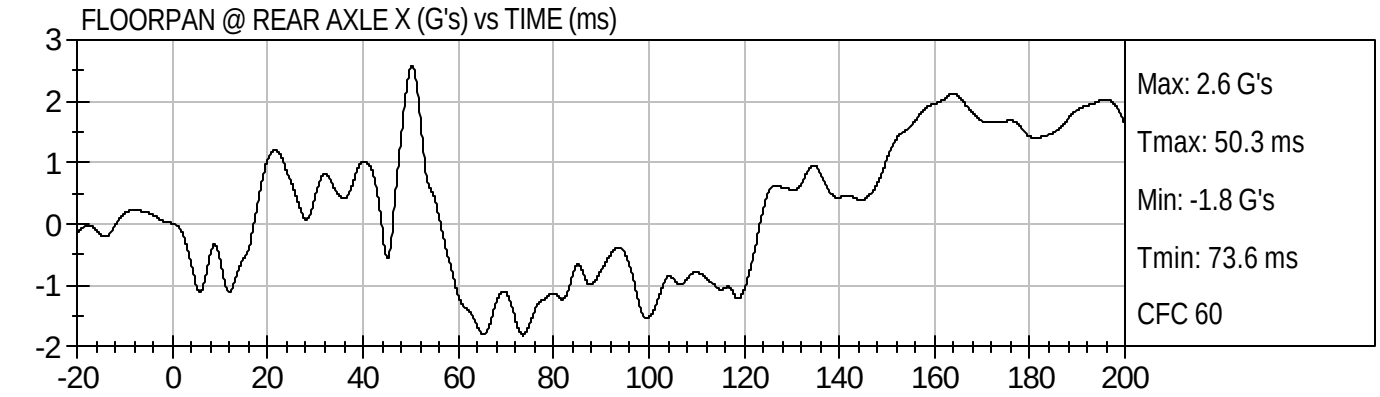

RIGHT REAR SILL X Velocity (kph) vs TIME (ms)
10
8
6
4
2
0
-2
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 8.5 kph
Tmax: 200.0 ms
Min: -0.2 kph
Tmin: 25.5 ms
CFC 180

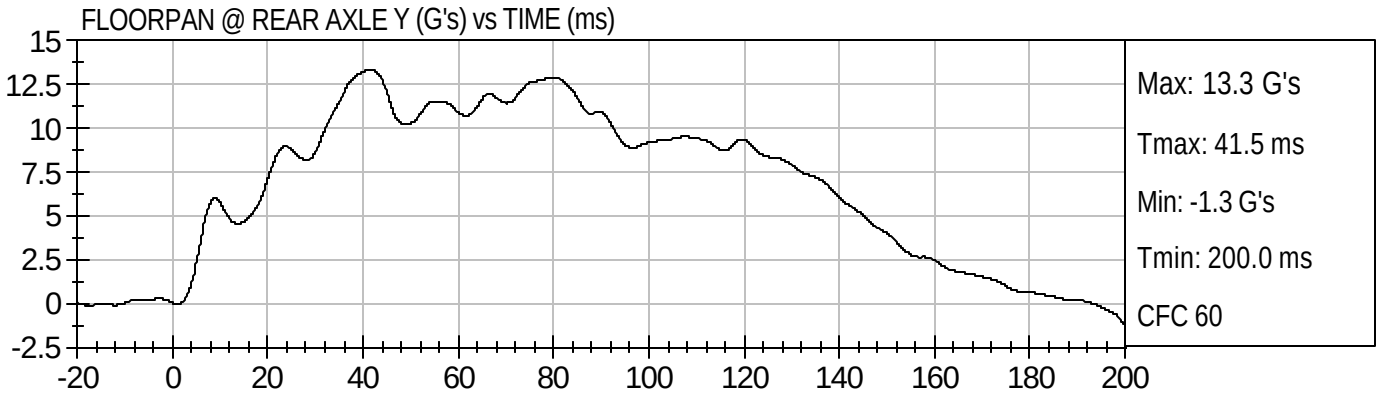

RIGHT REAR SILL Y Velocity (kph) vs TIME (ms)
35
30
25
20
15
10
5
0
-5
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.3 kph
Tmax: 0.4 ms
Min: -3.4 kph
Tmin: 183.1 ms
CFC 180

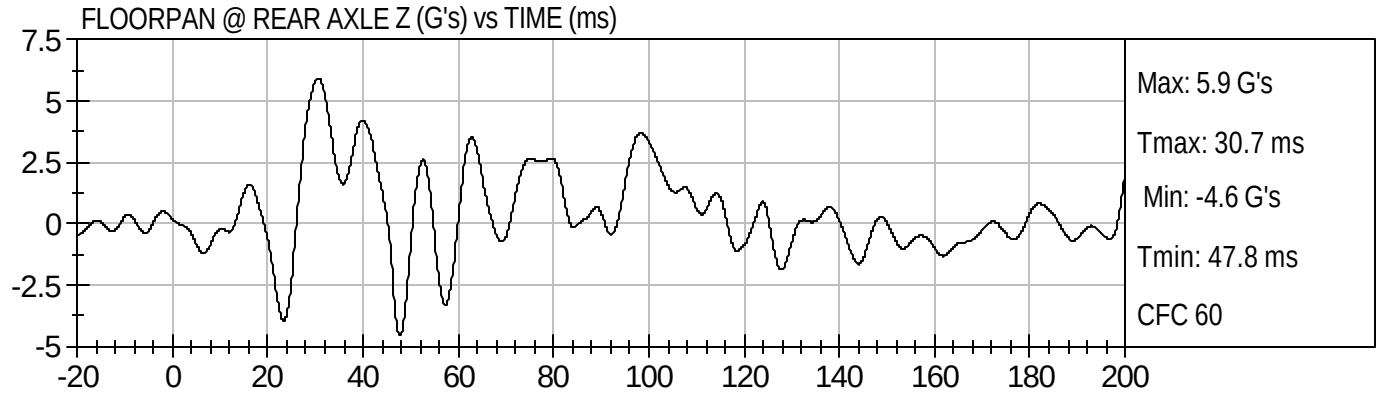

RIGHT REAR SILL Z Velocity (kph) vs TIME (ms)
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 0.3 kph
Tmax: 200.0 ms
Min: -2.6 kph
Tmin: 69.4 ms
CFC 180

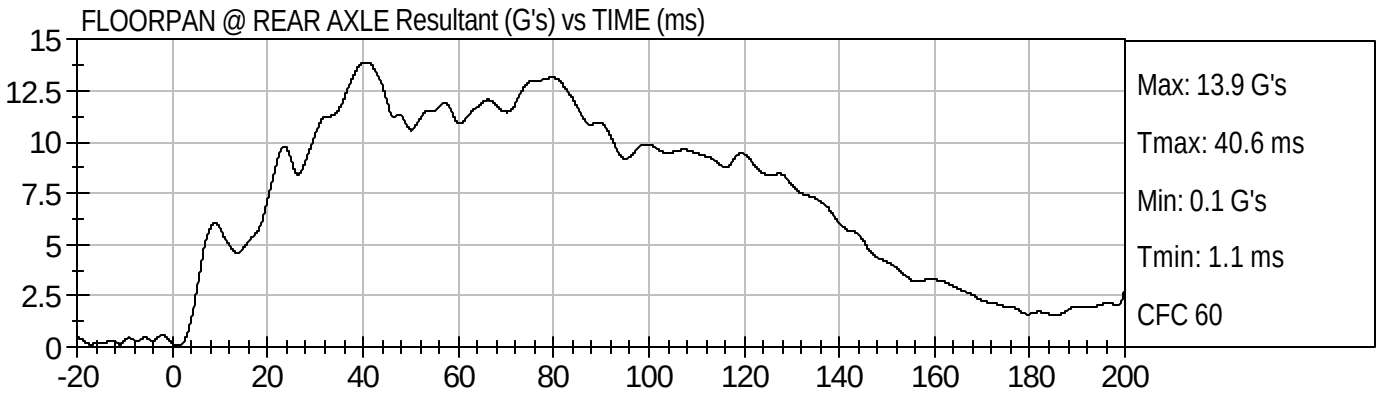
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

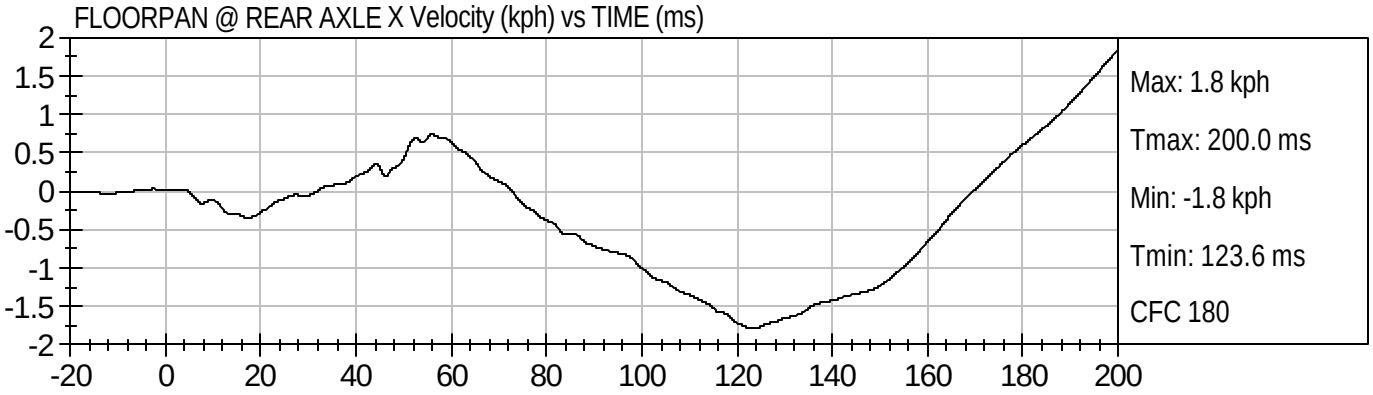
Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

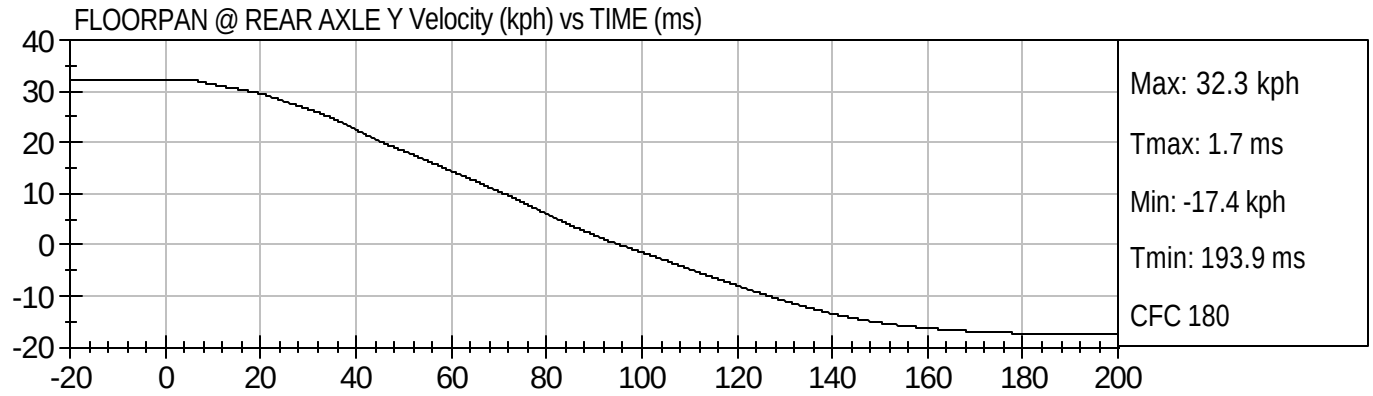


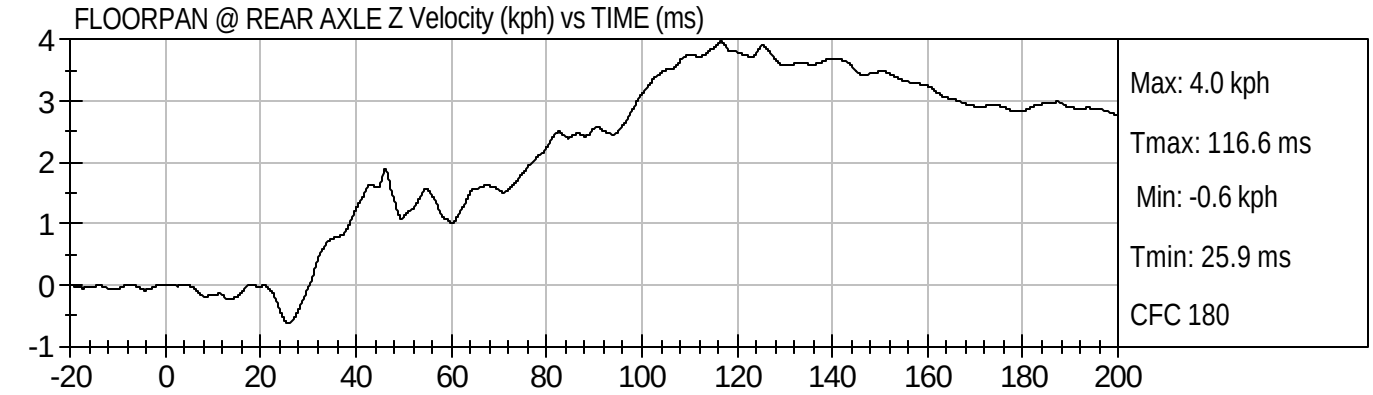






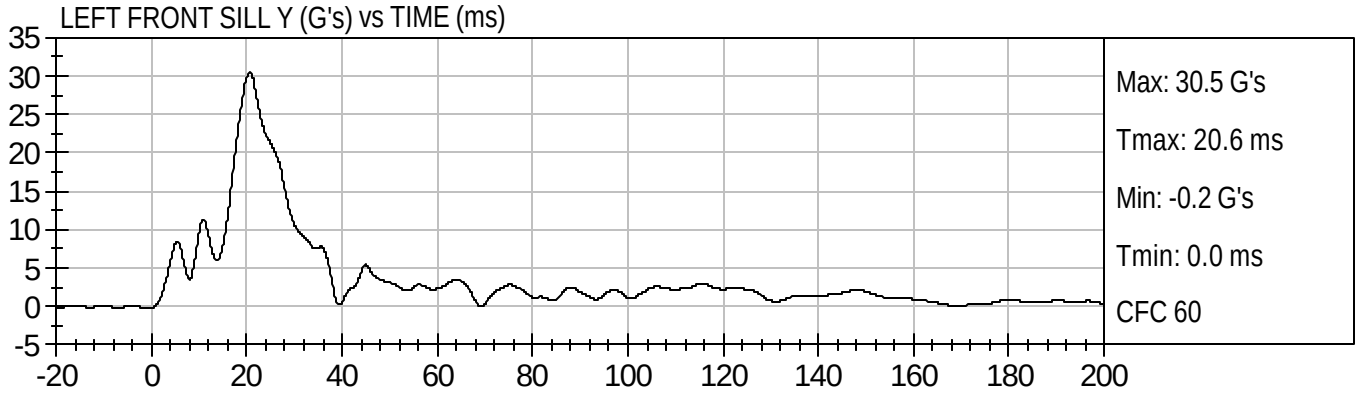

FLOORPAN @ REAR AXLE X Velocity (kph) vs TIME (ms)
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 1.8 kph
Tmax: 200.0 ms
Min: -1.8 kph
Tmin: 123.6 ms
CFC 180

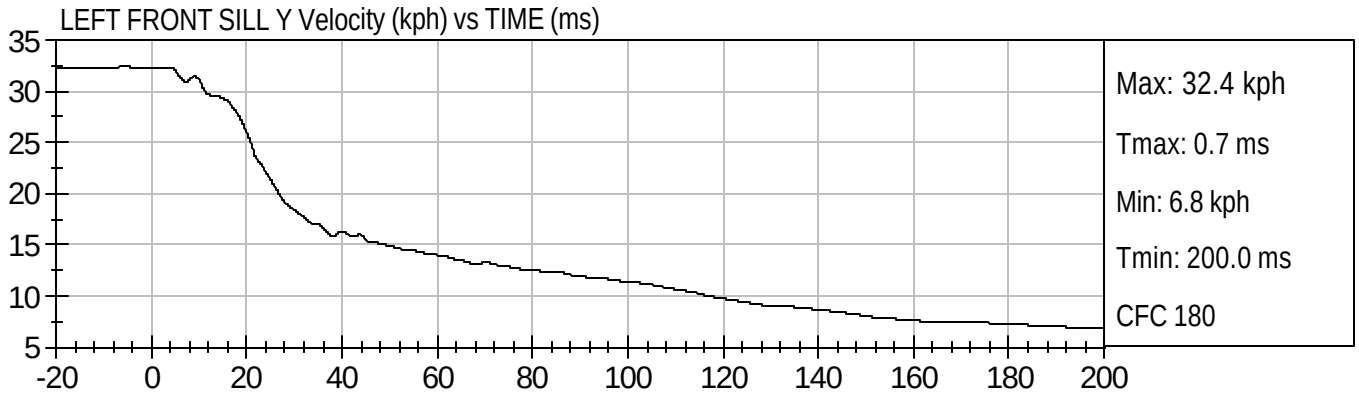

FLOORPAN @ REAR AXLE Y Velocity (kph) vs TIME (ms)
40
30
20
10
0
-10
-20
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 32.3 kph
Tmax: 1.7 ms
Min: -17.4 kph
Tmin: 193.9 ms
CFC 180

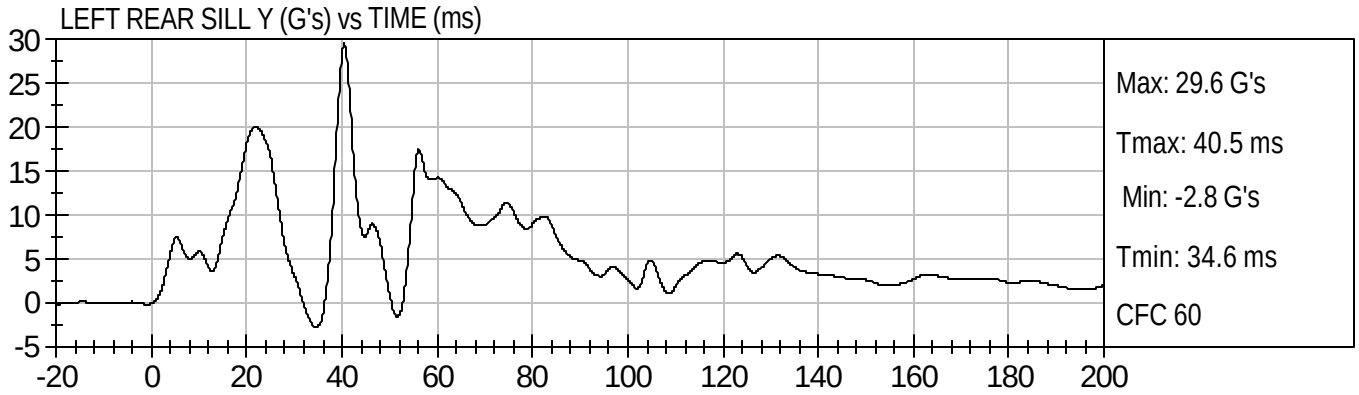

FLOORPAN @ REAR AXLE Z Velocity (kph) vs TIME (ms)
4
3
2
1
0
-1
-20
0
20
40
60
80
100
120
140
160
180
200
Max: 4.0 kph
Tmax: 116.6 ms
Min: -0.6 kph
Tmin: 25.9 ms
CFC 180

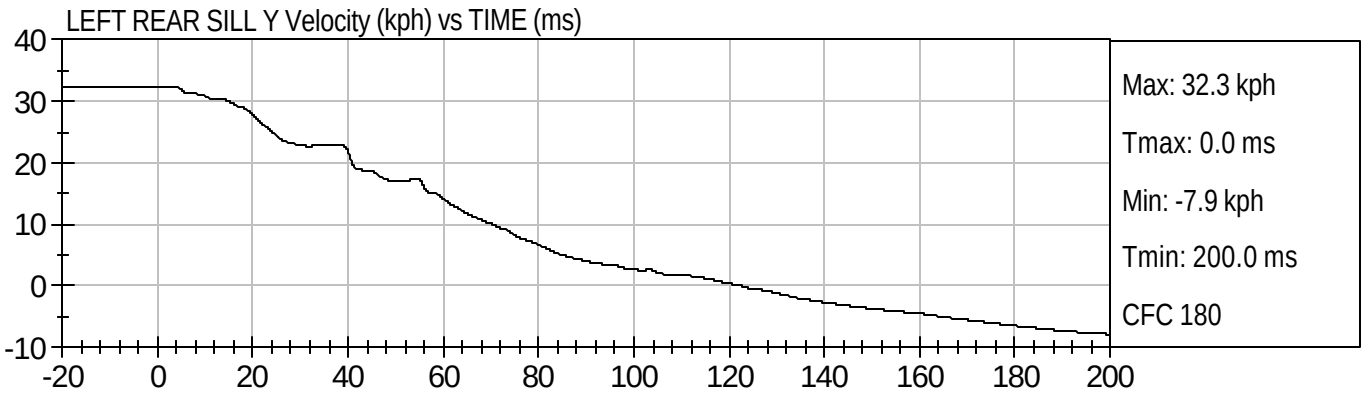
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



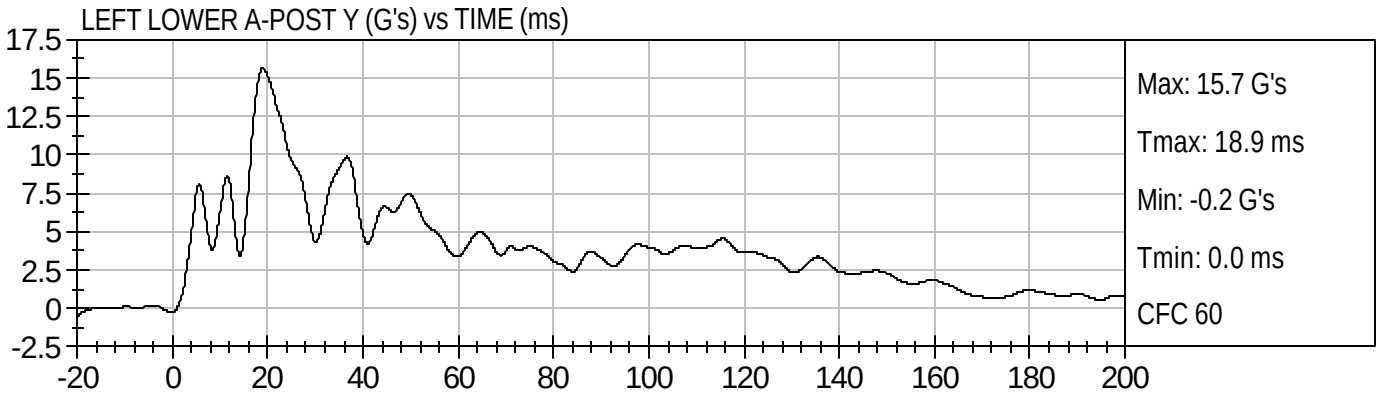


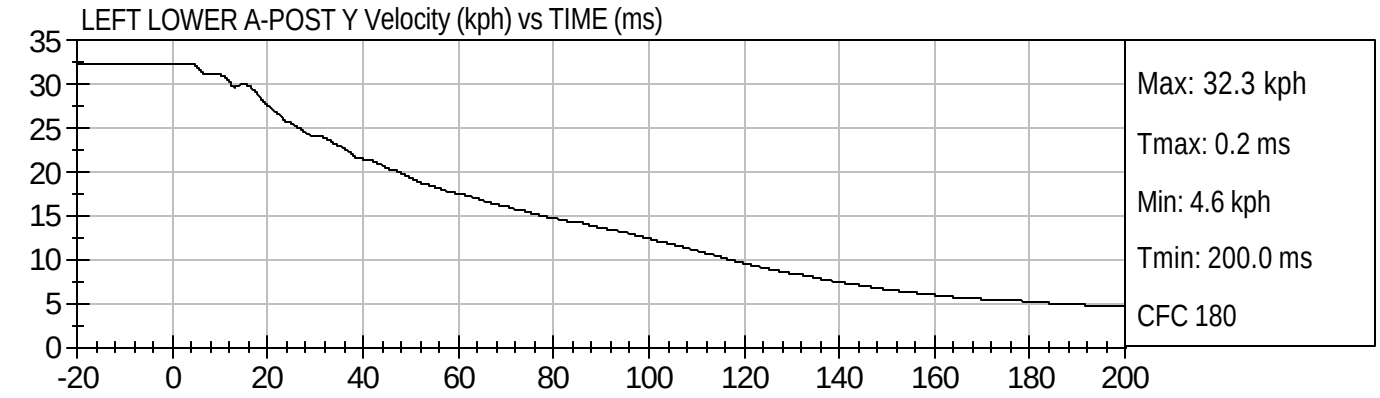


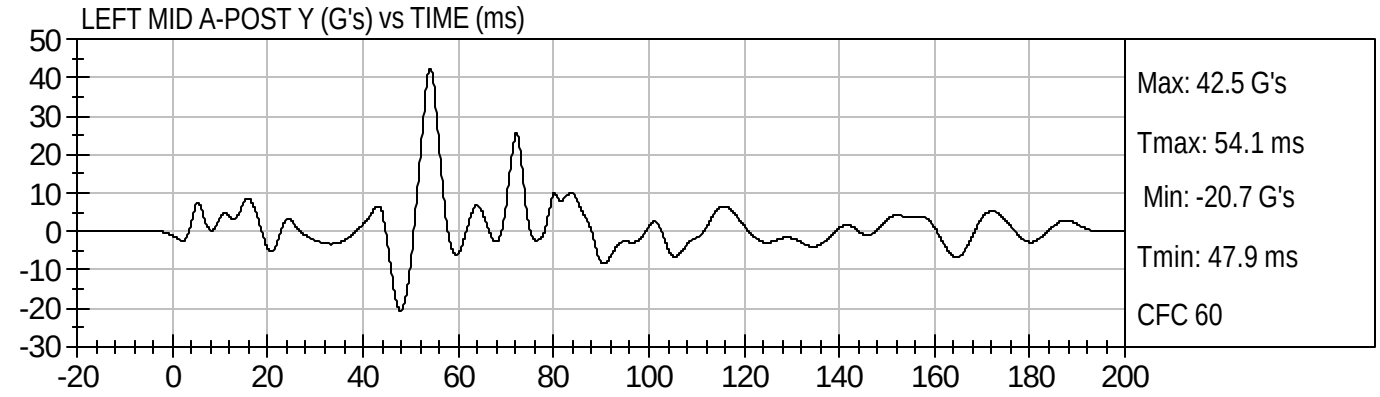


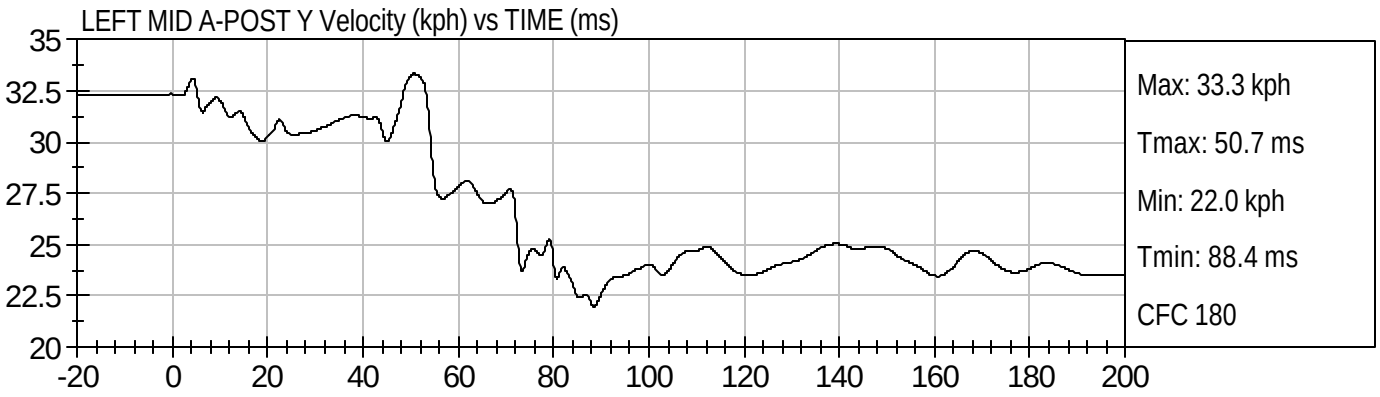
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



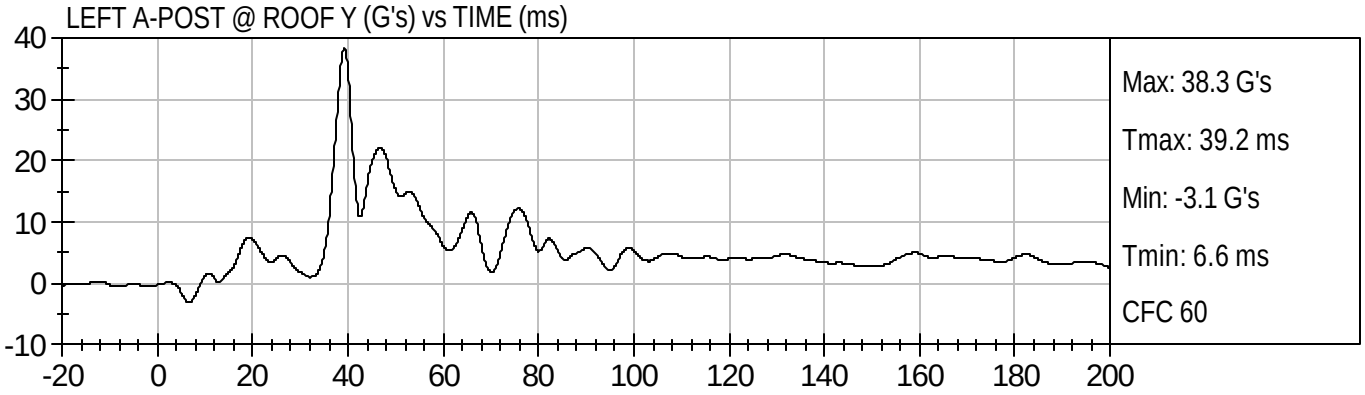


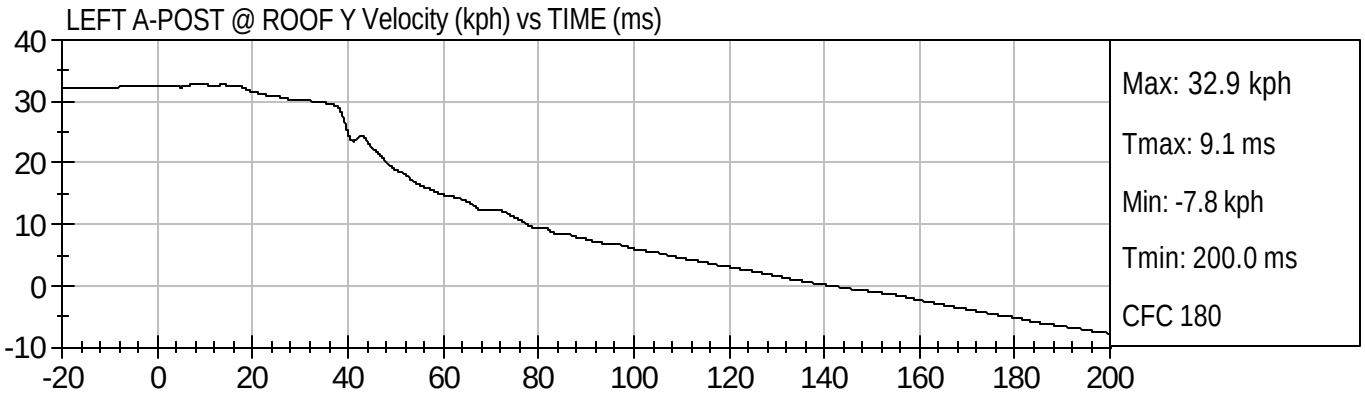


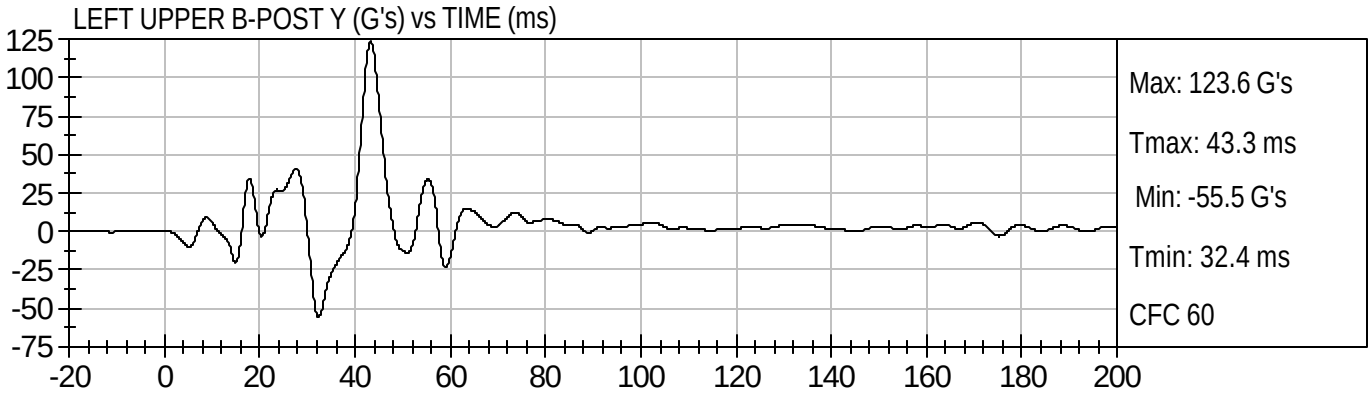


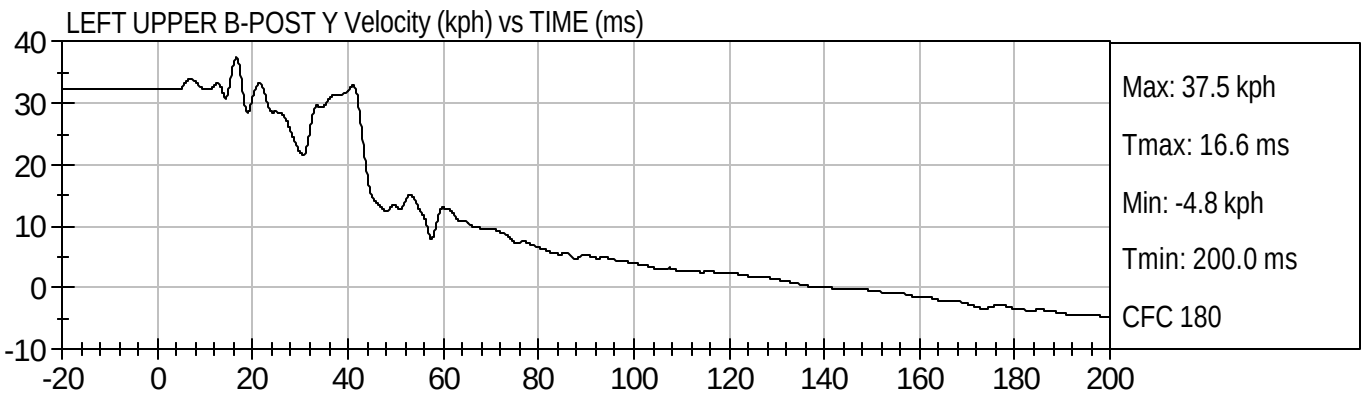
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



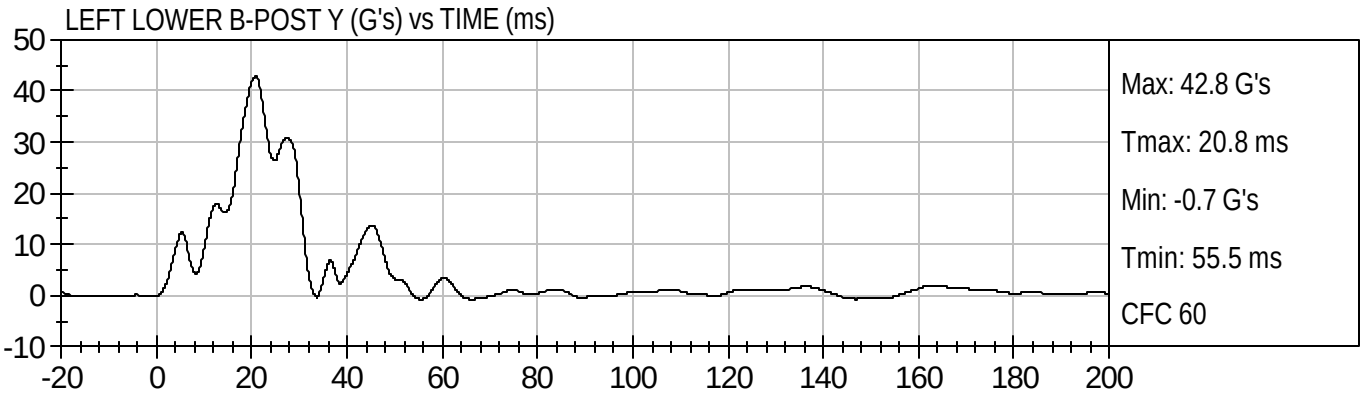


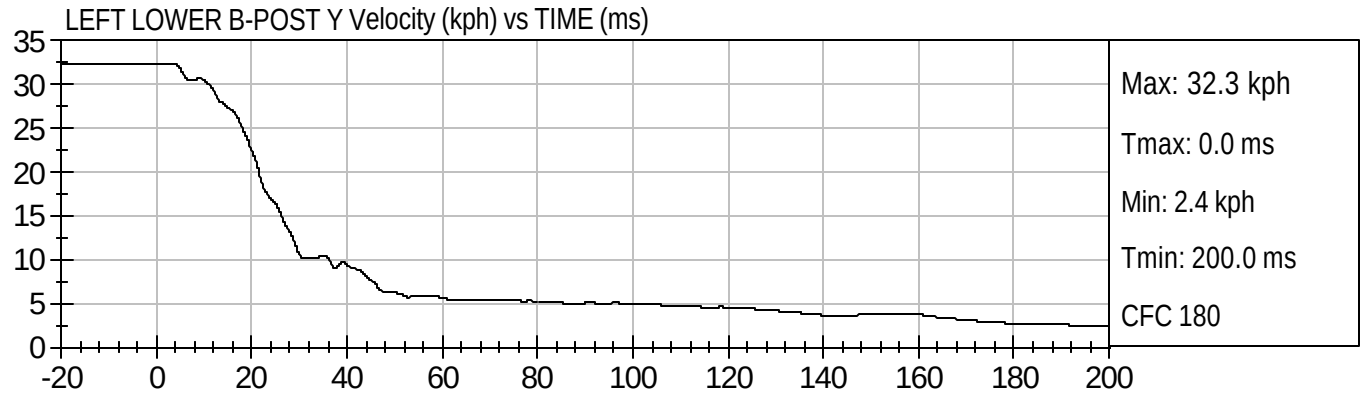


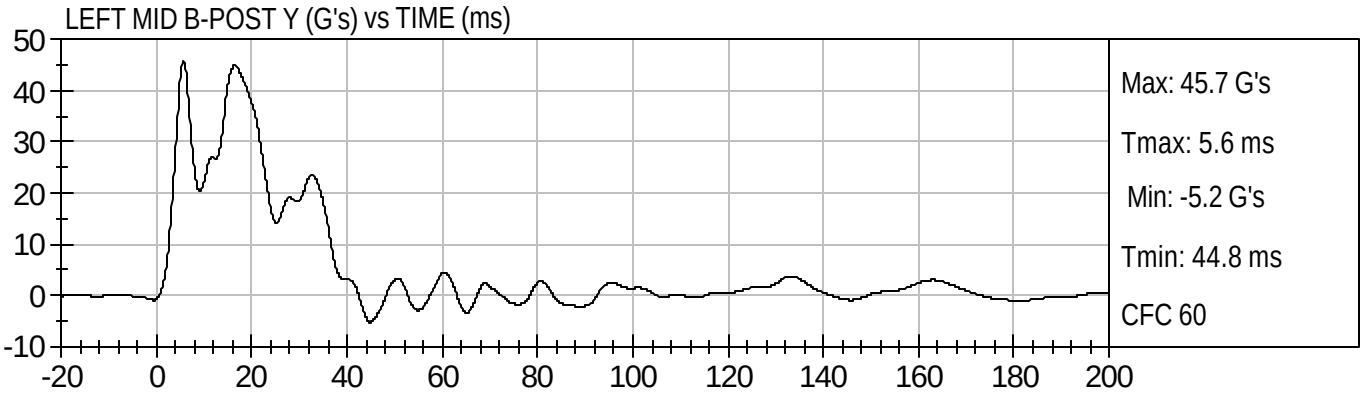


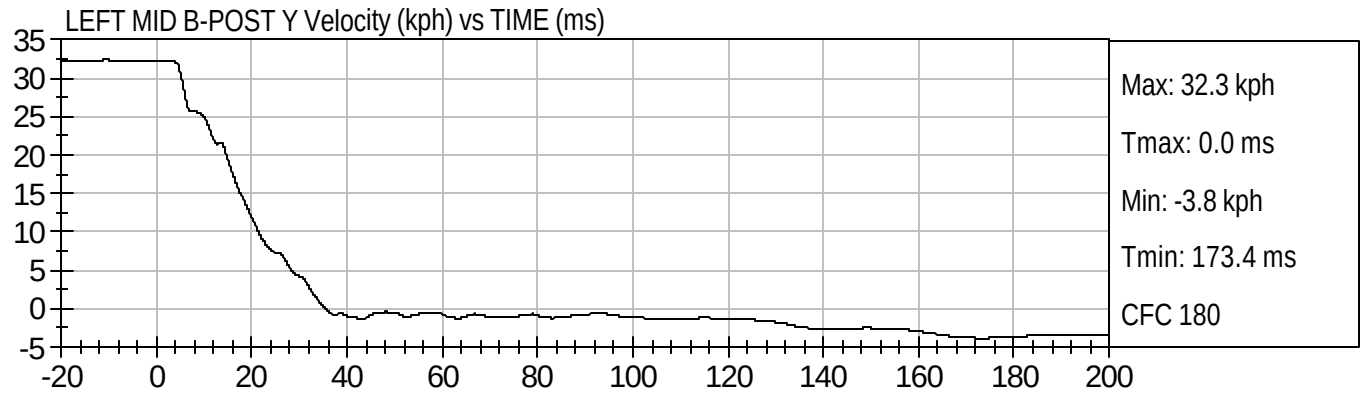
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



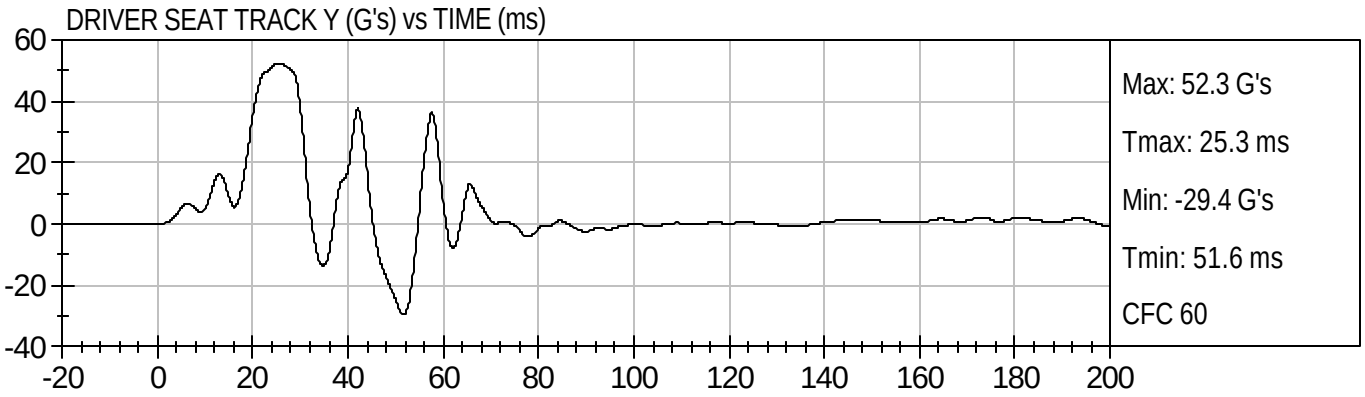


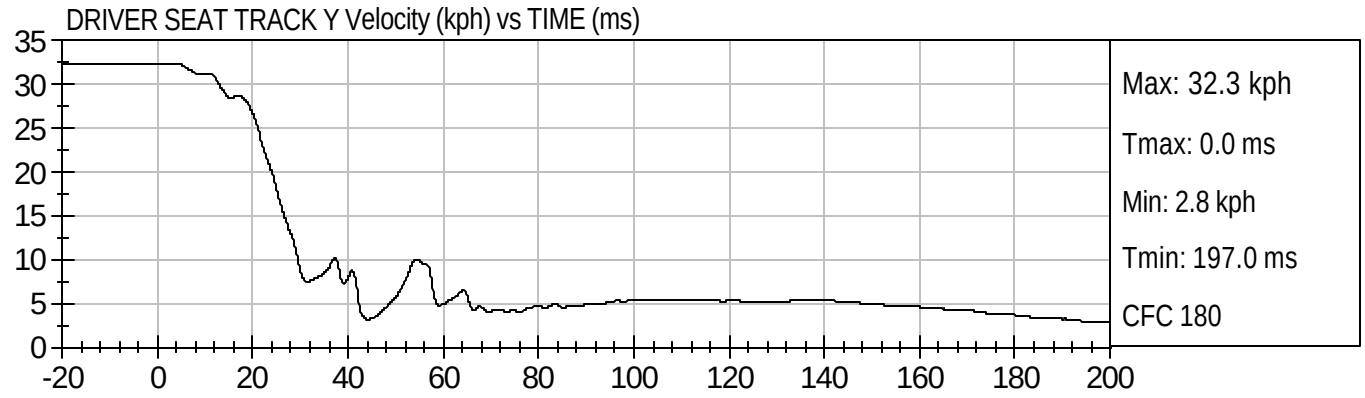




OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

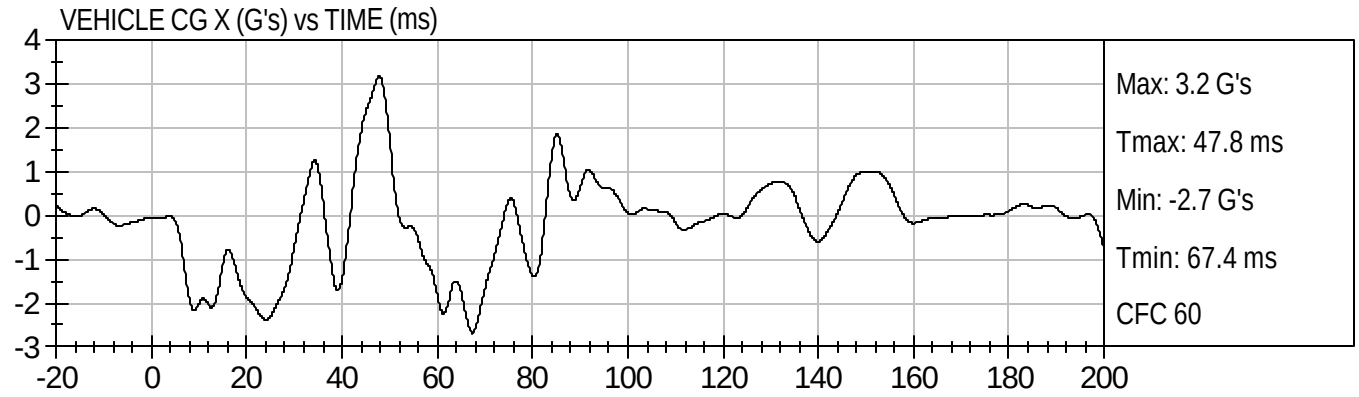
Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

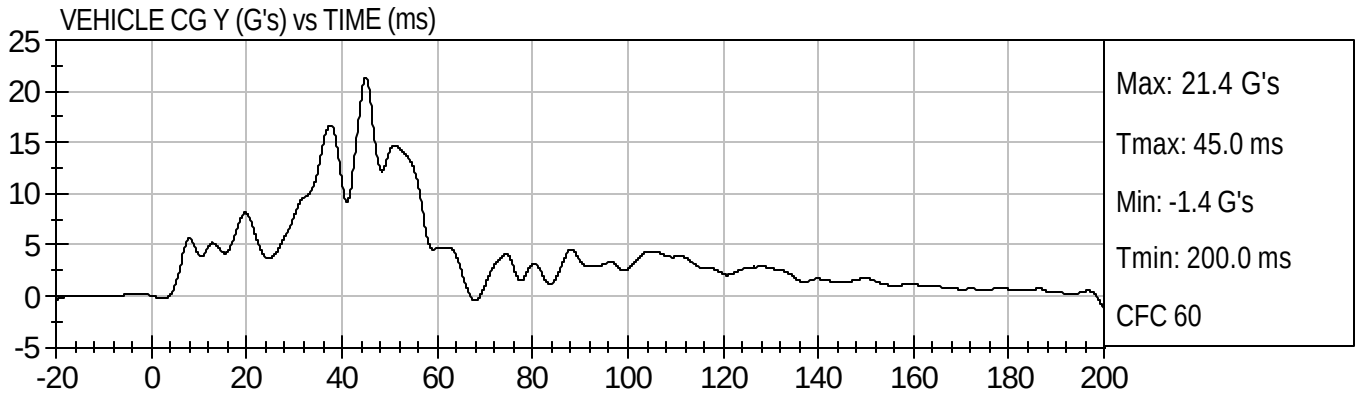


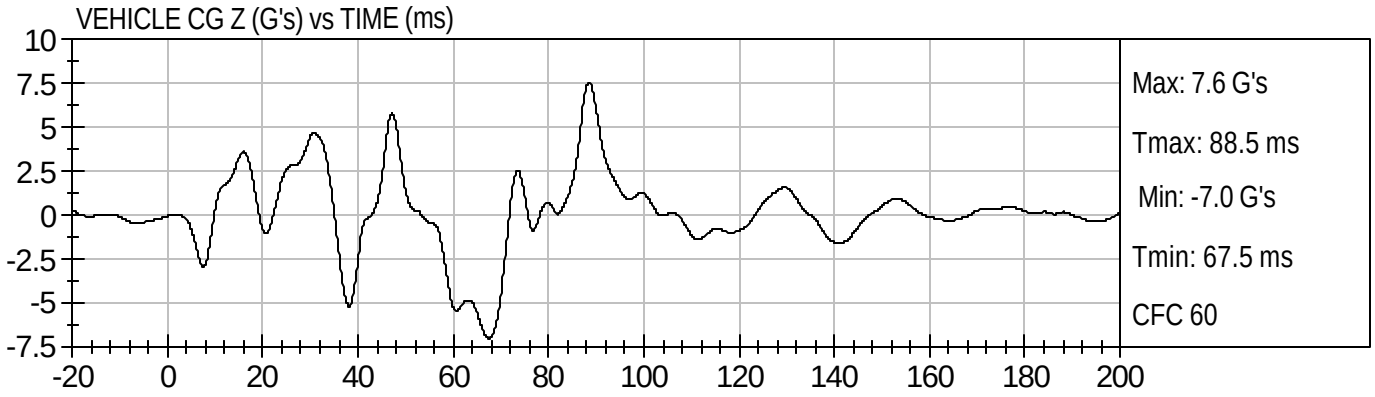


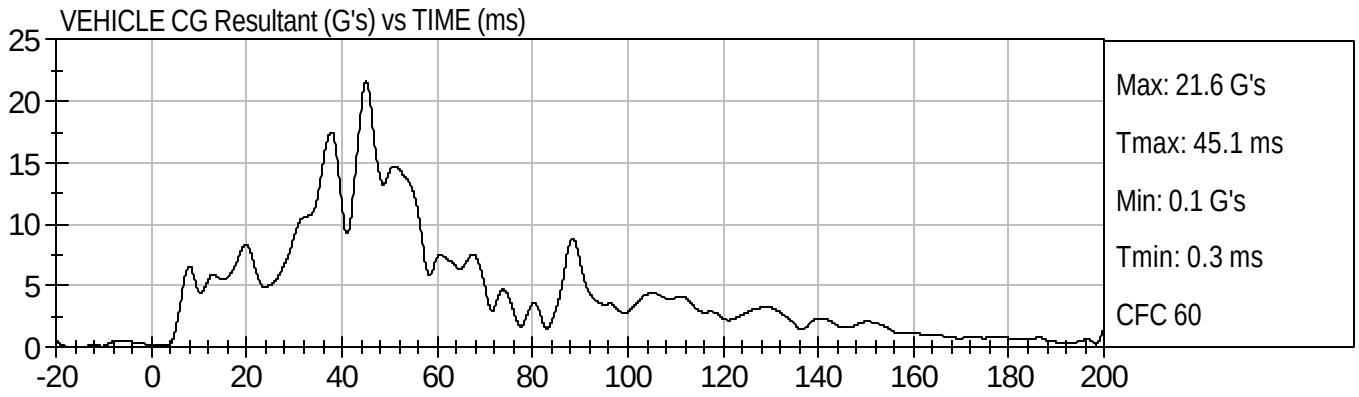
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



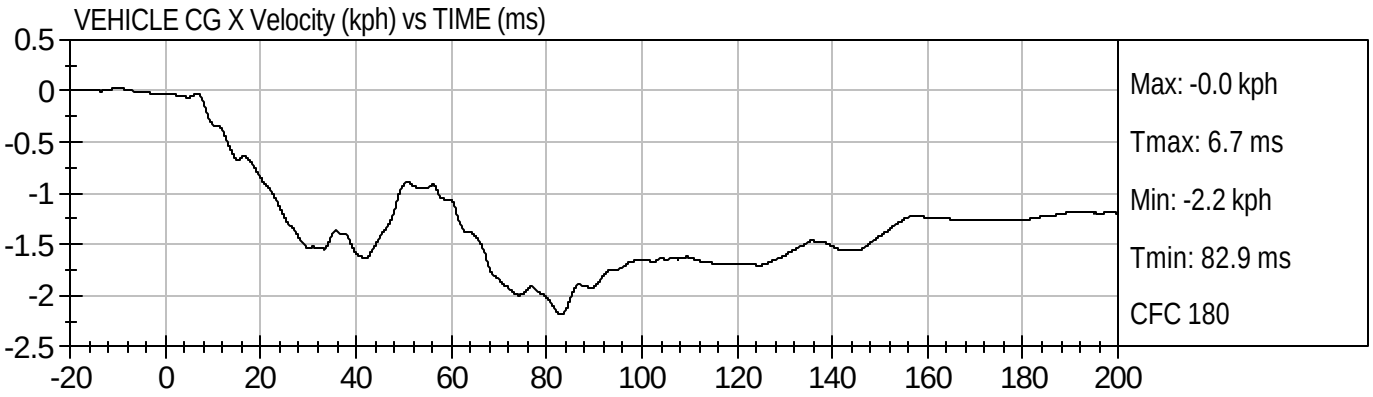


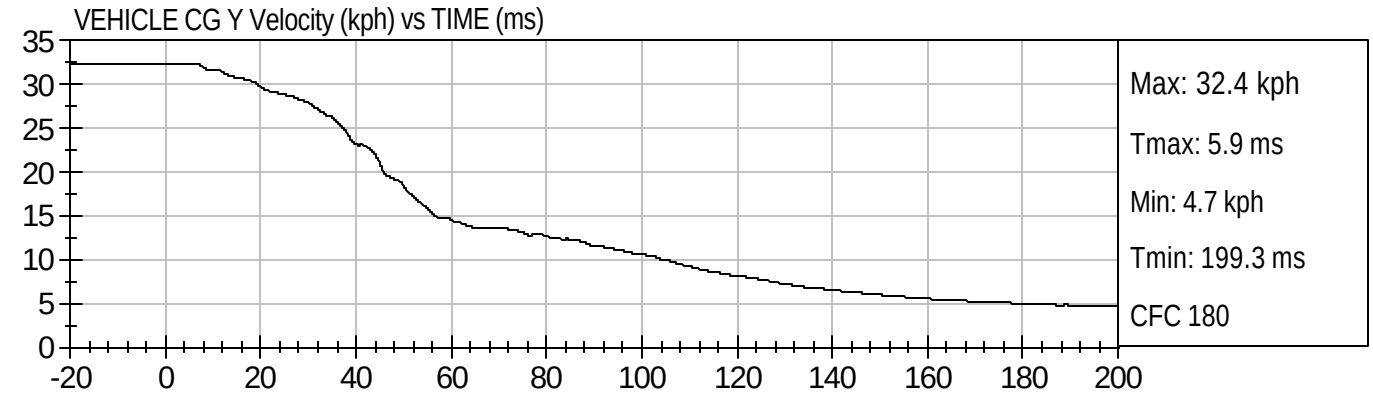


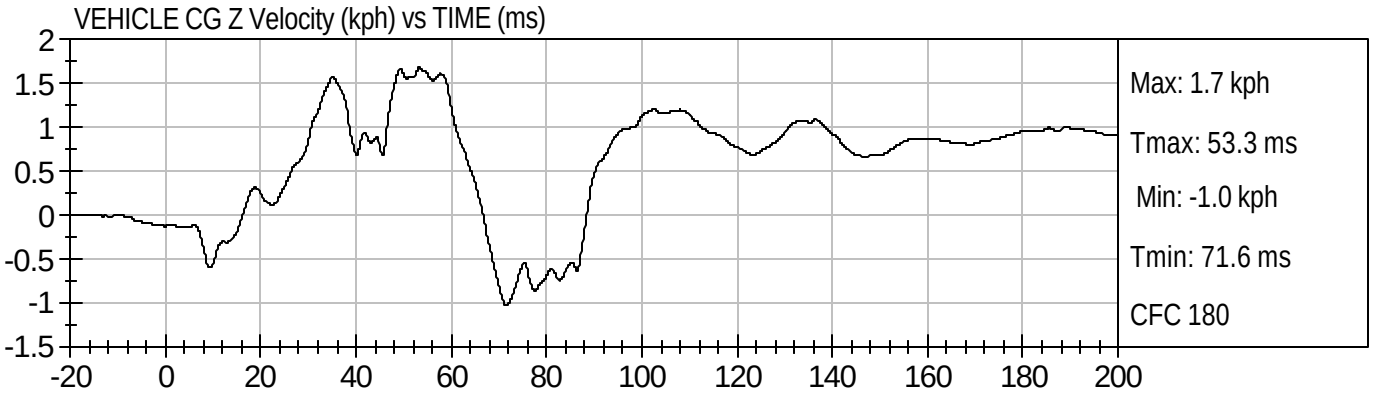


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

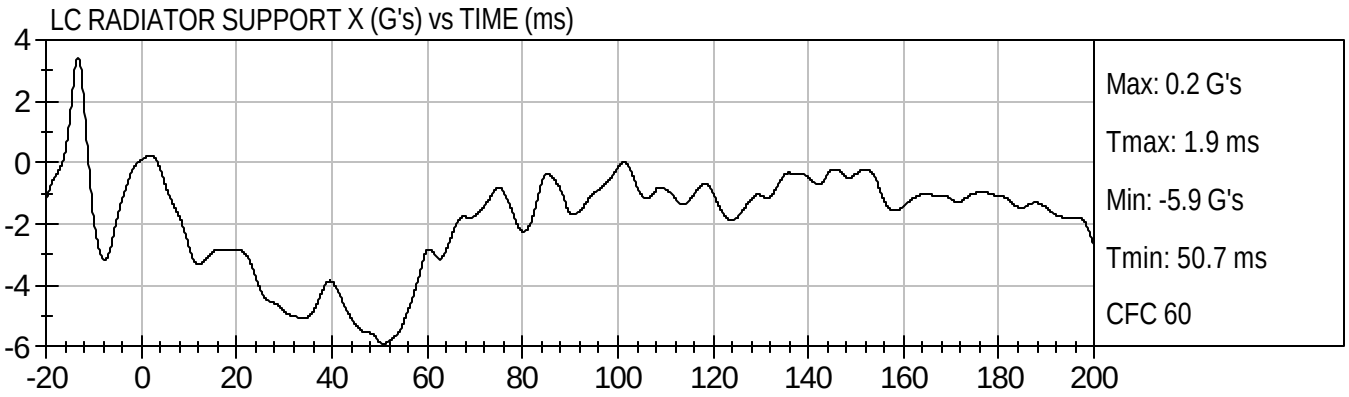


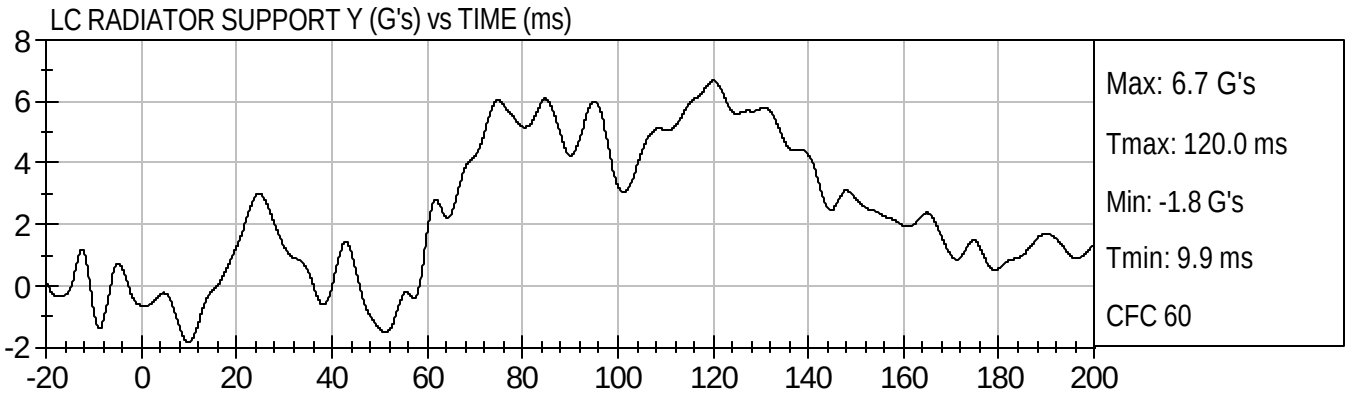


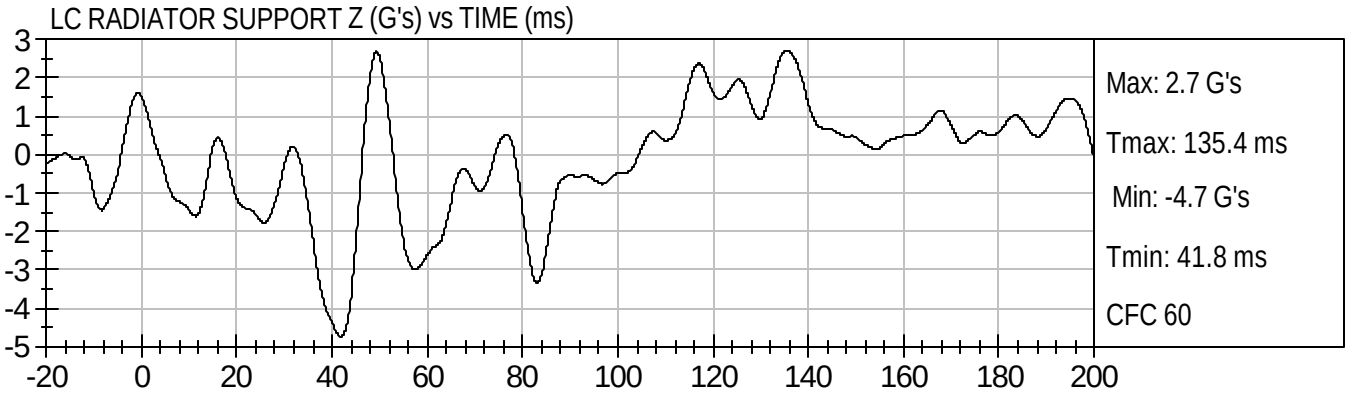


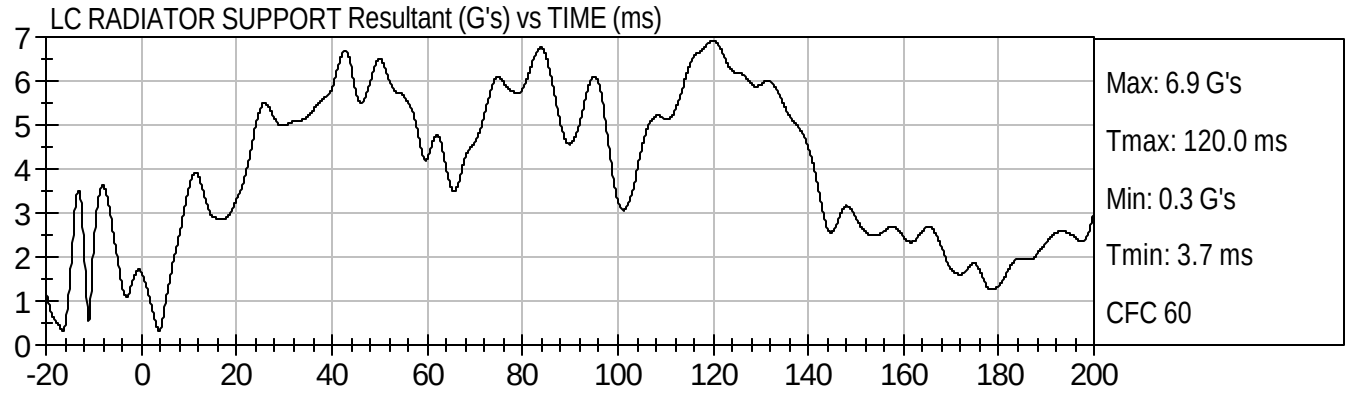
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



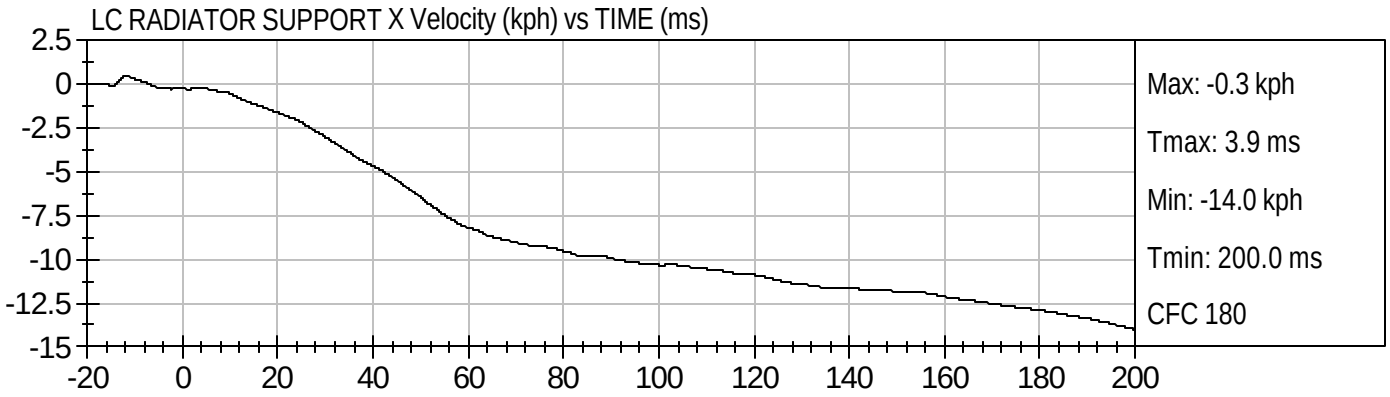


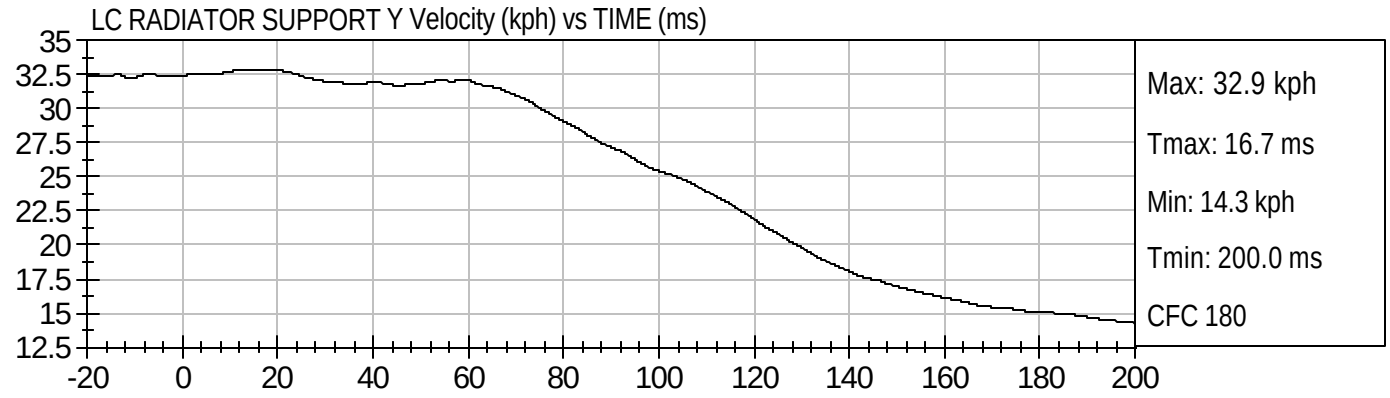


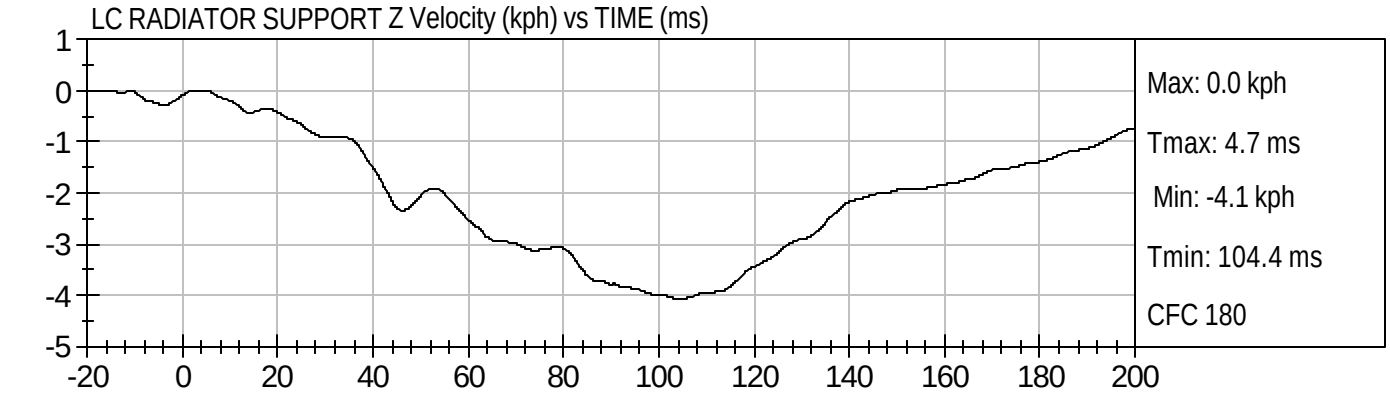


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

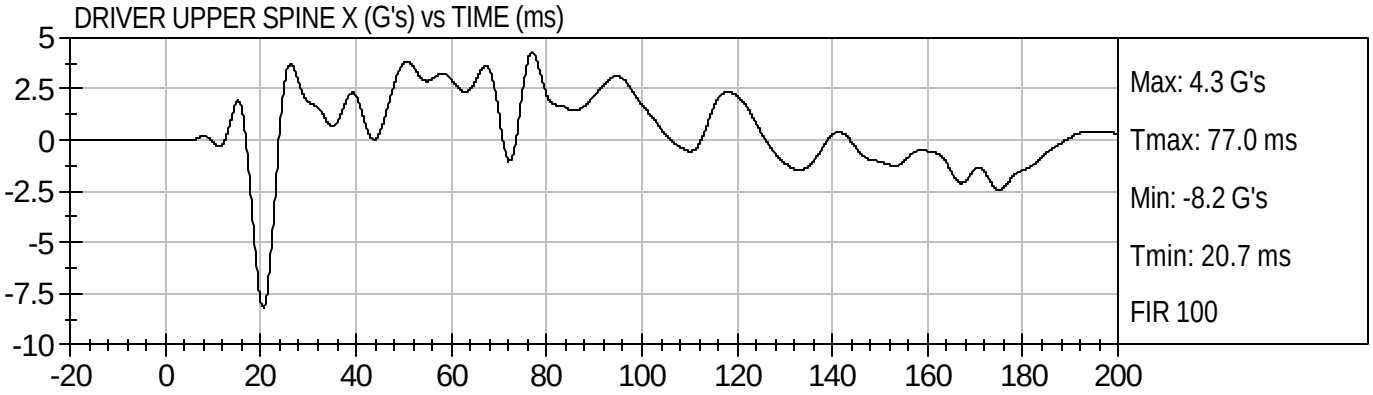


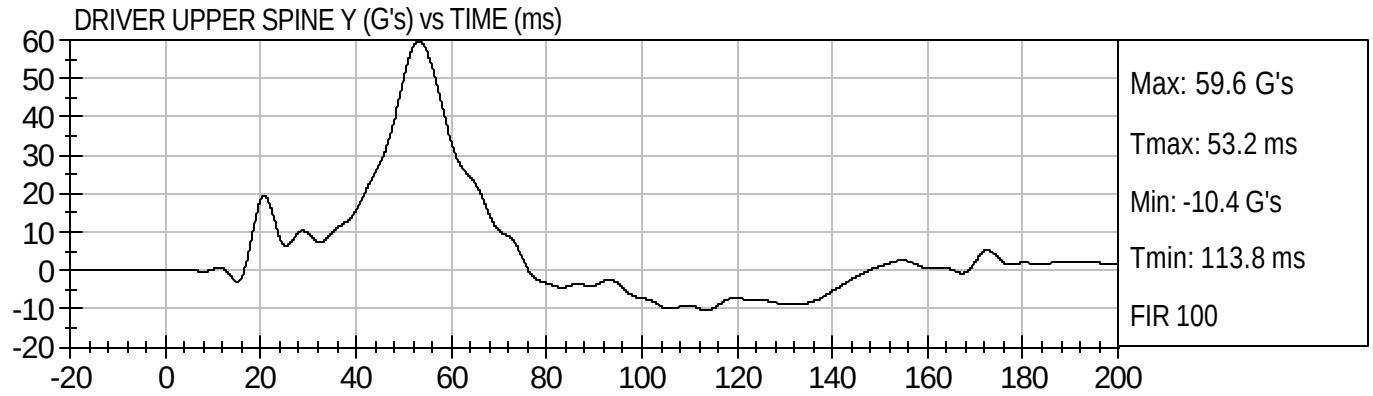




OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

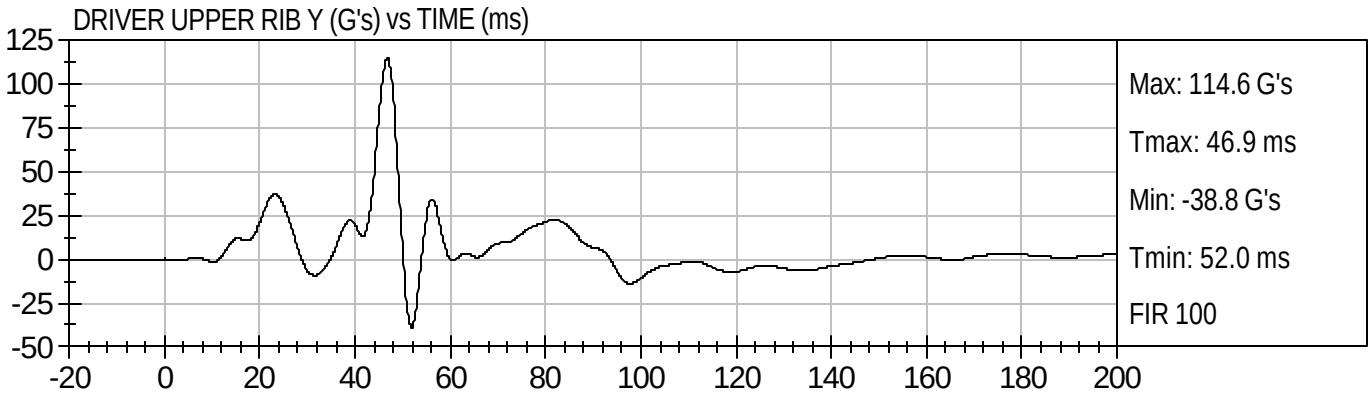
Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

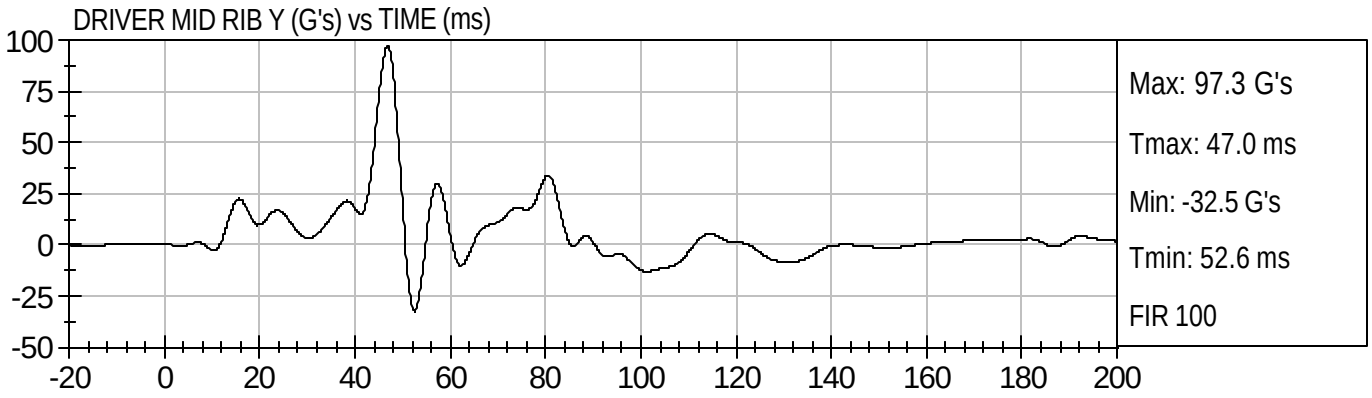


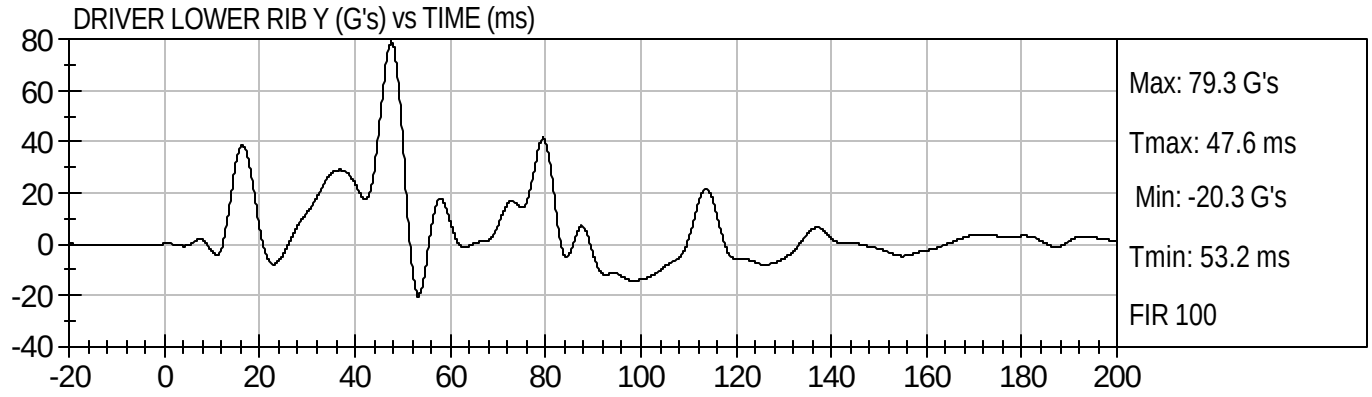


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

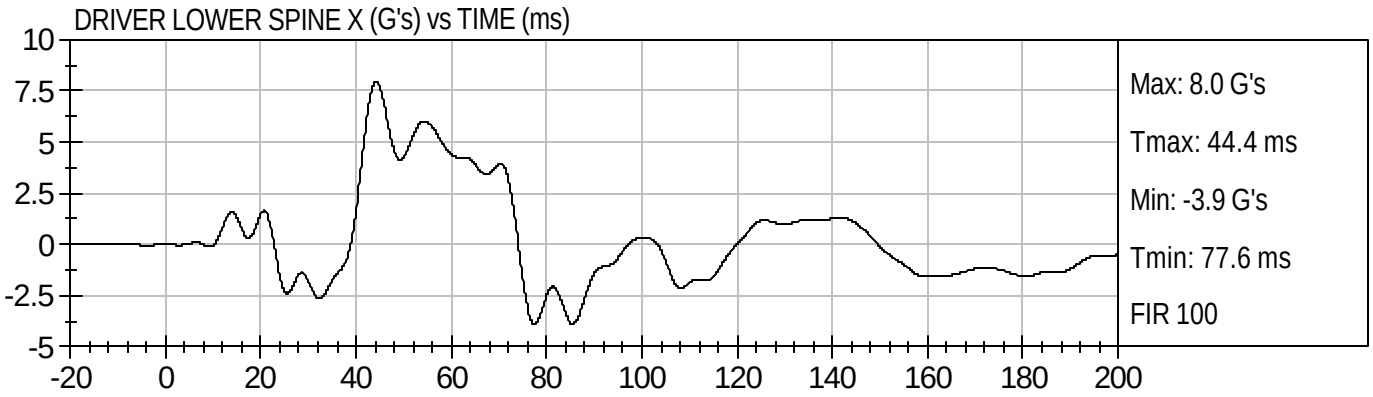


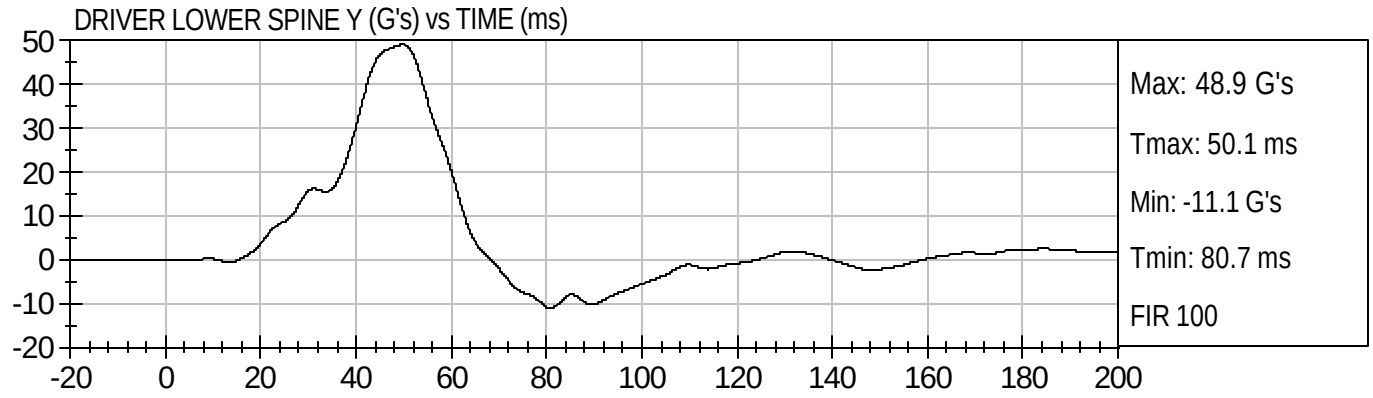


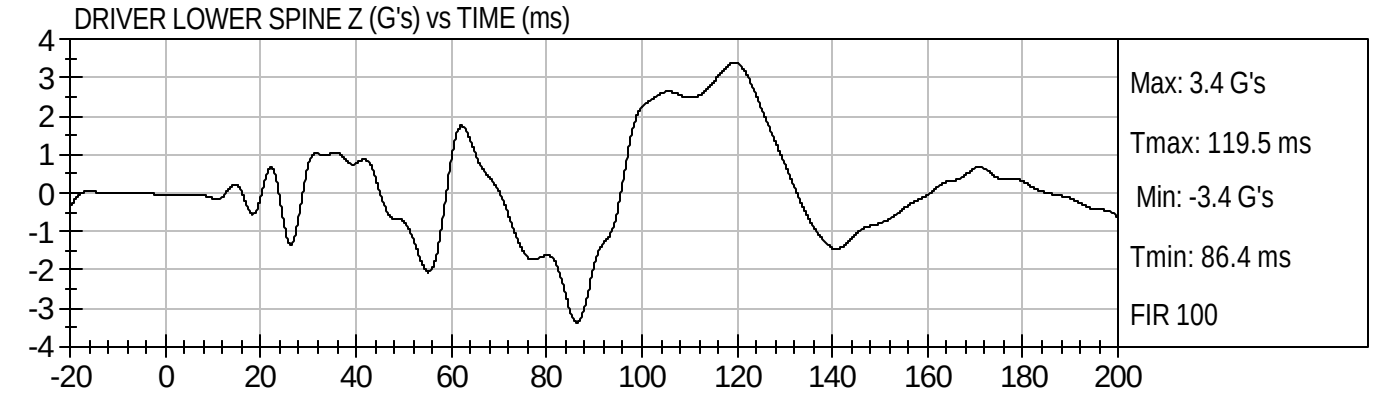


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

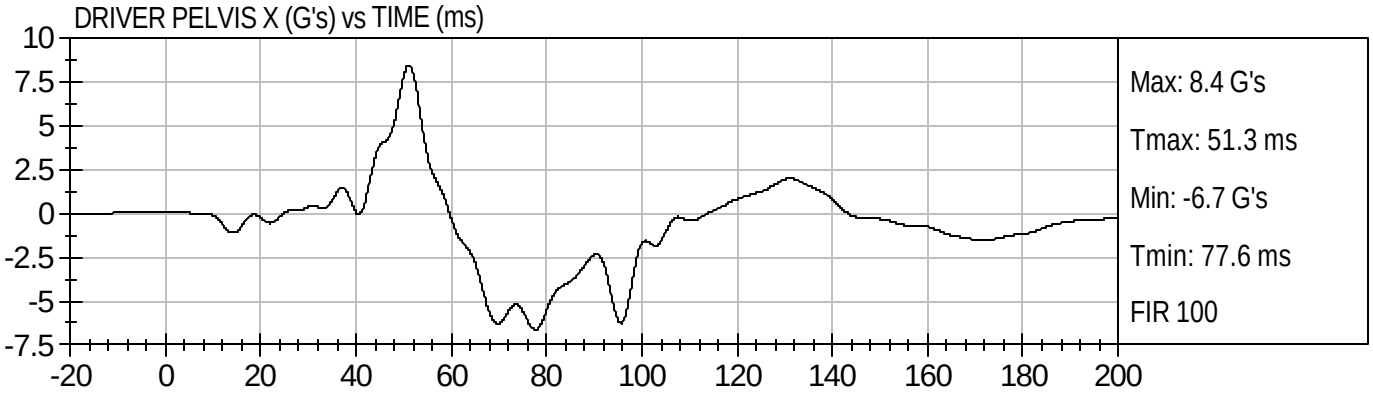


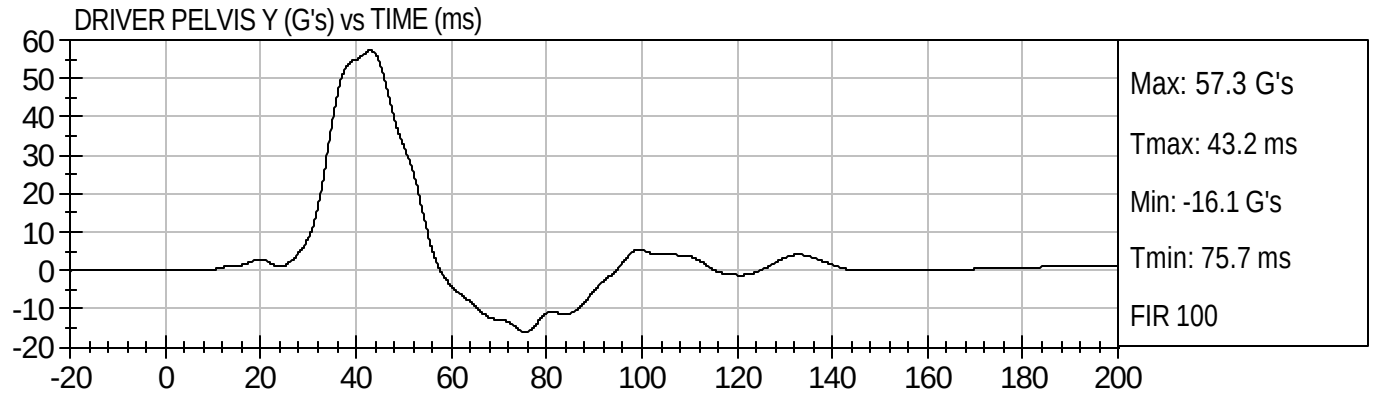


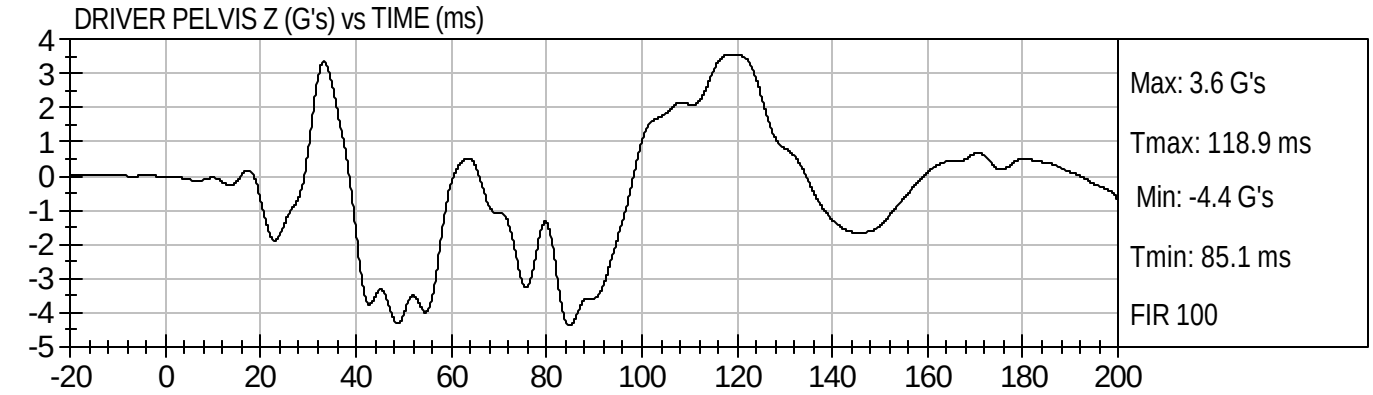


OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)

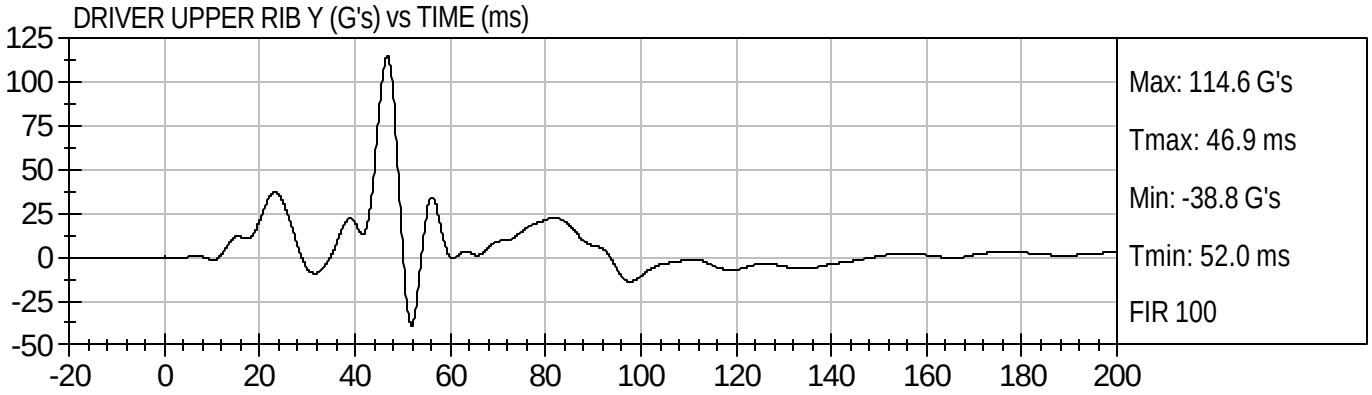


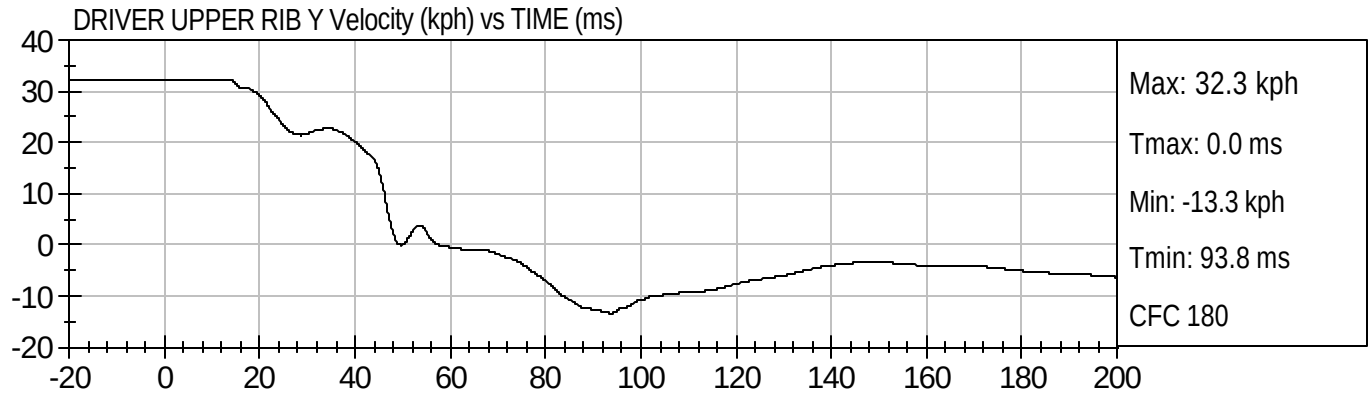


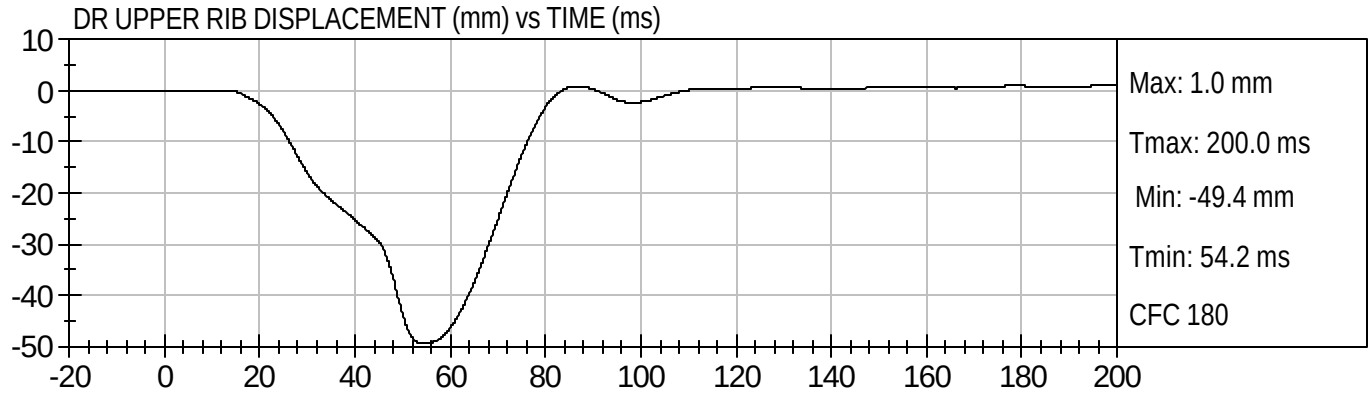


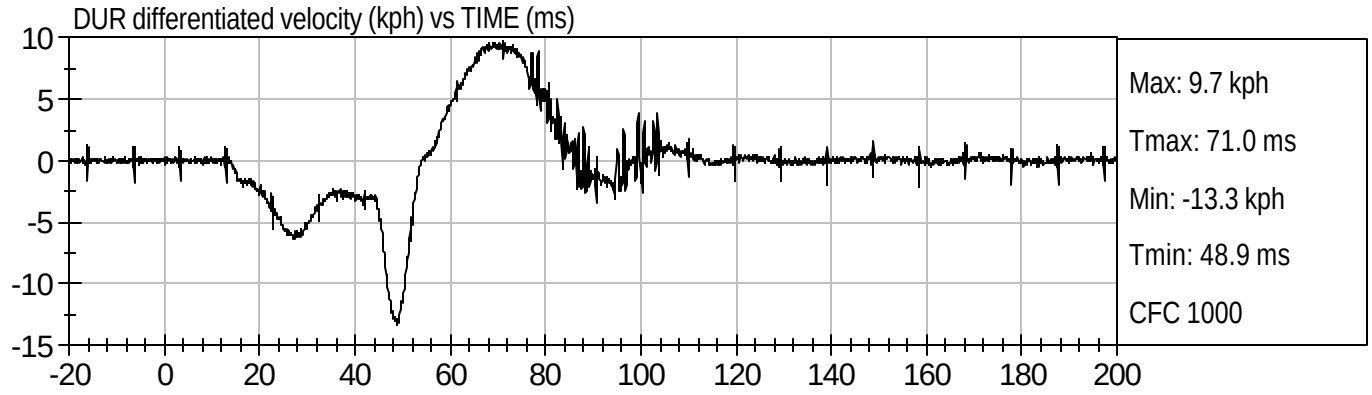
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



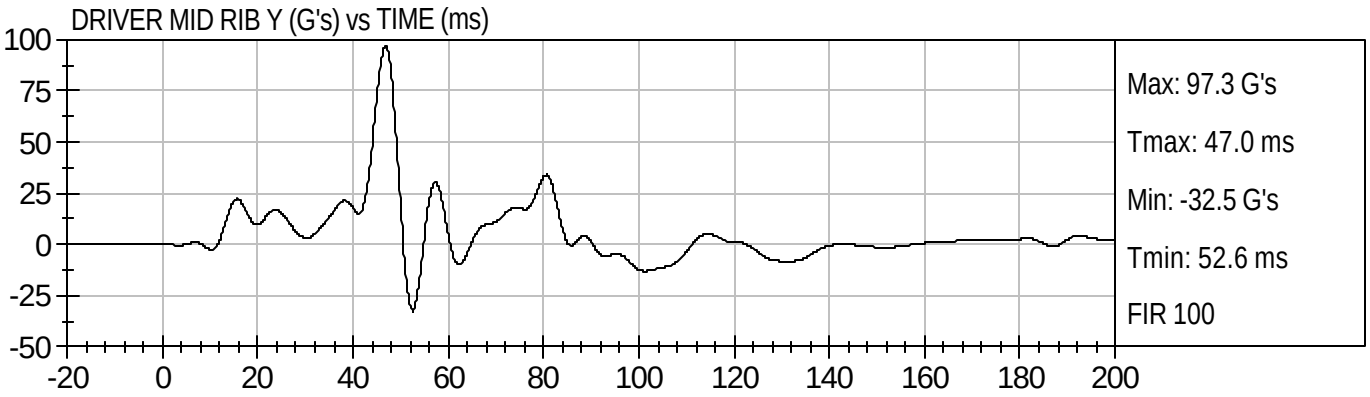


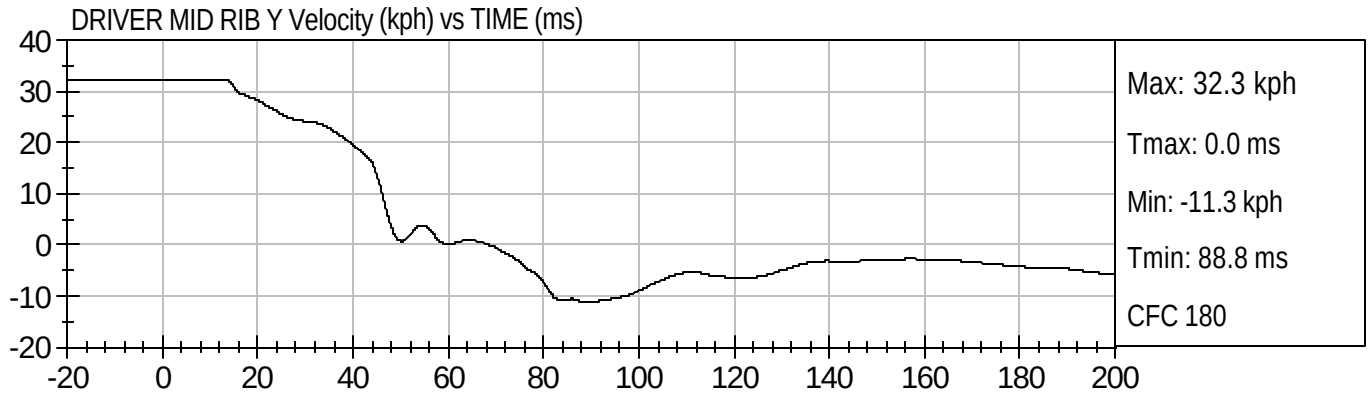


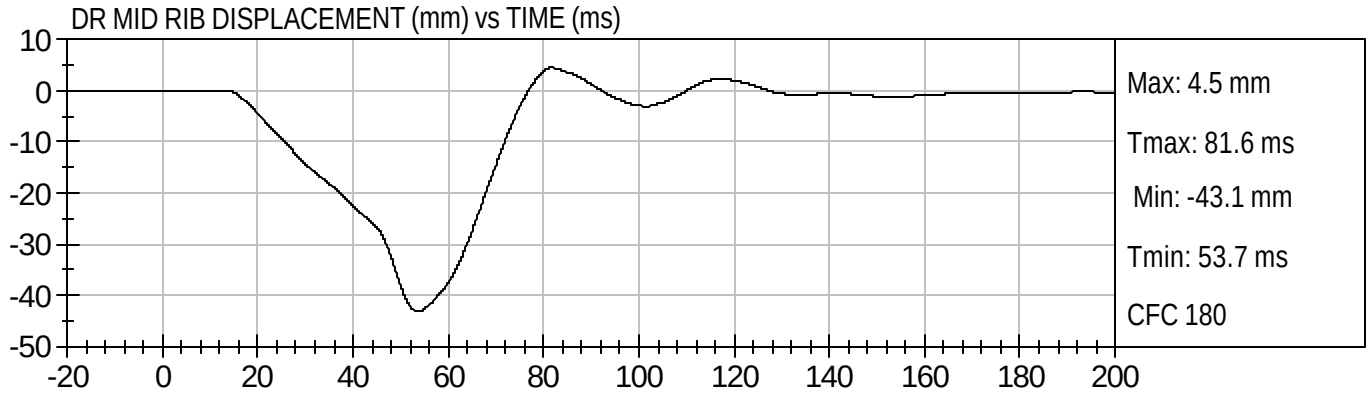


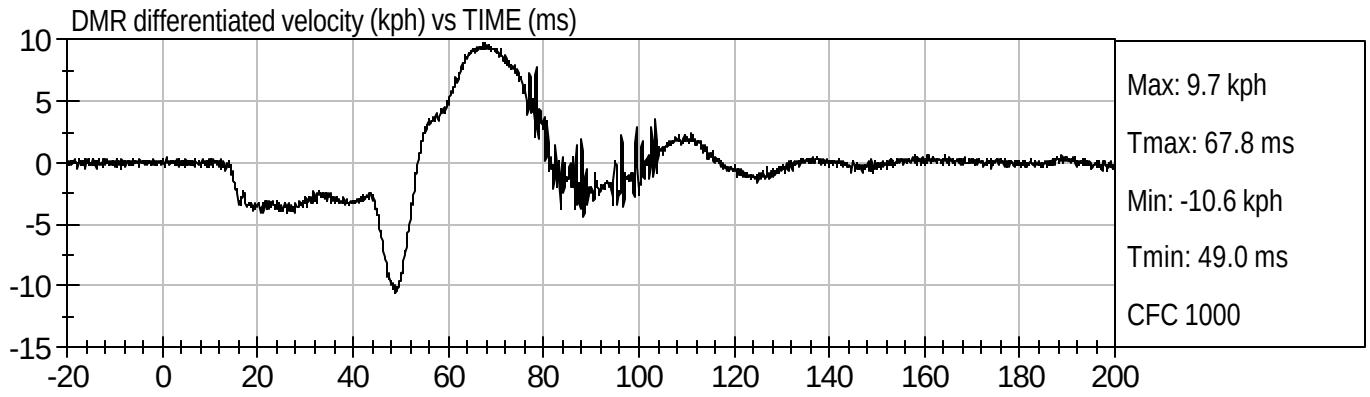
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)



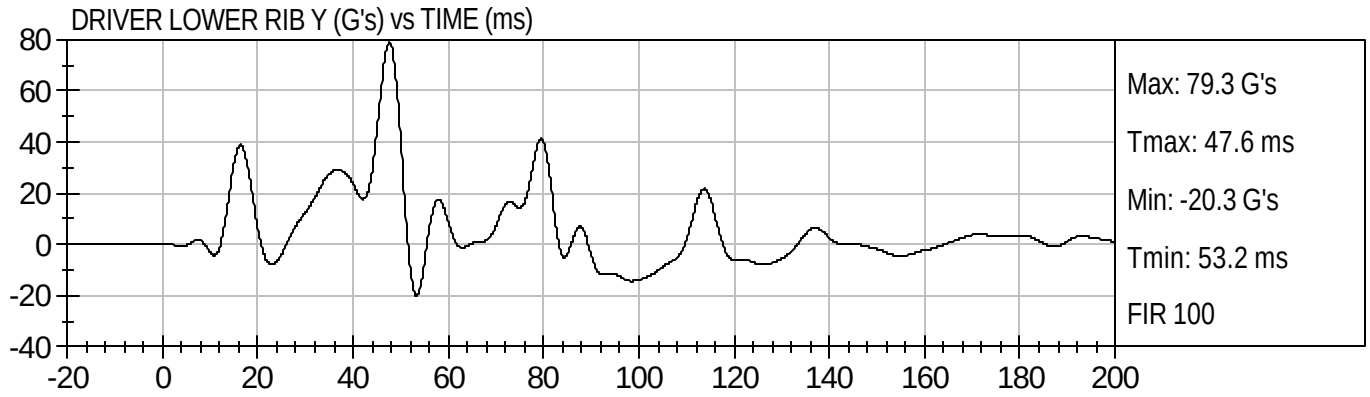


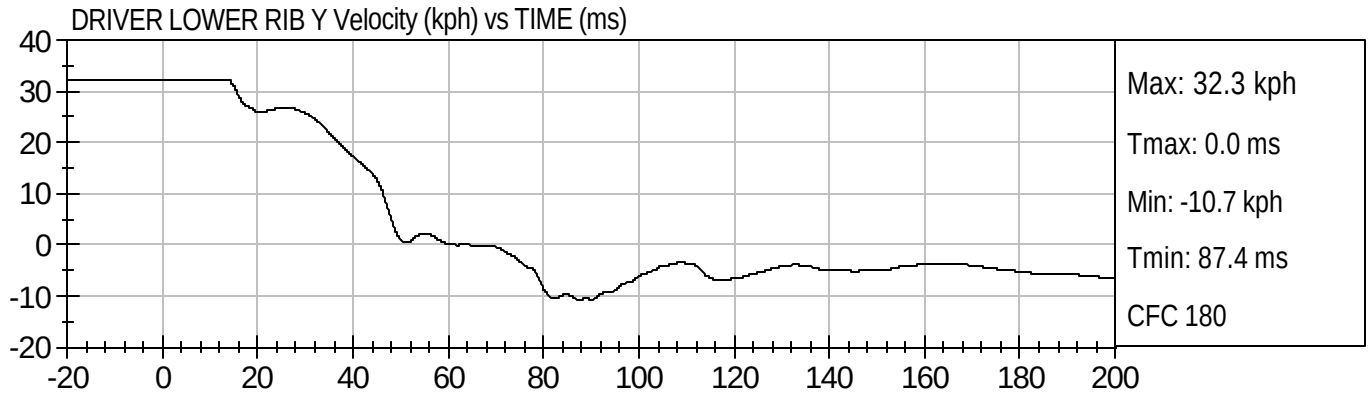


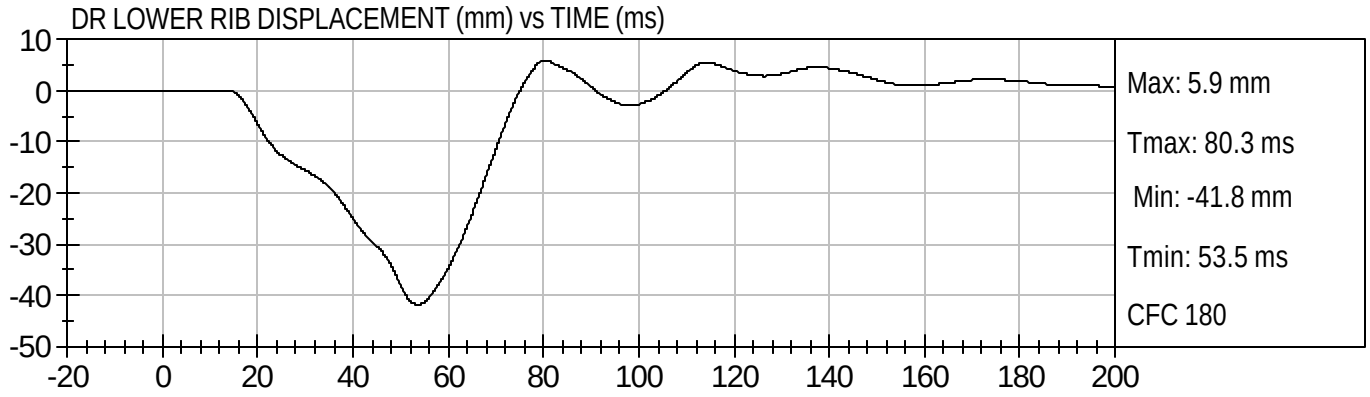


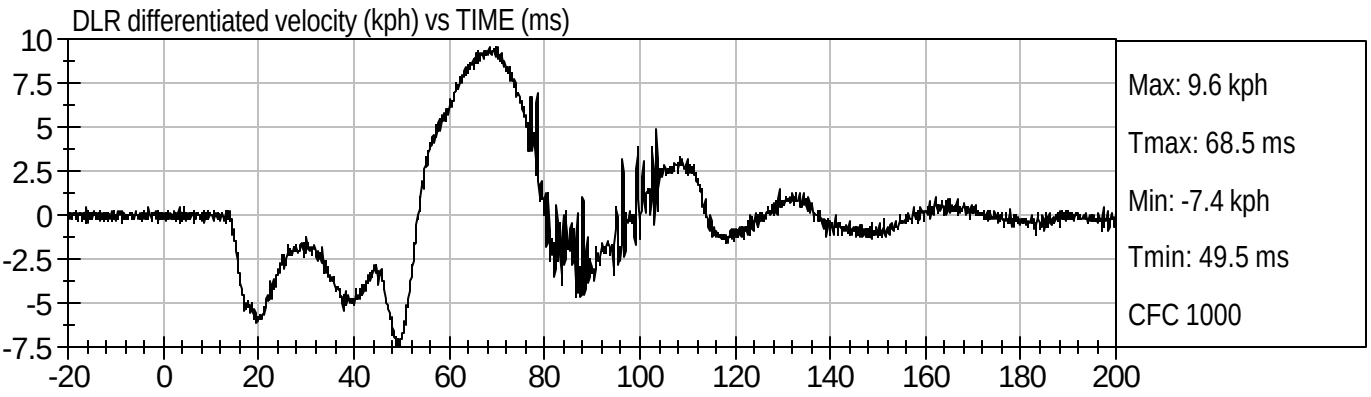
OBLIQUE RIGID POLE IMPACT
2000 SAAB 9-5 RY0518

Test Date: 2/26/2003
Speed: 20.1 mph (32.3 km/h)









APPENDIX C

ES-2 CONFIGURATION AND PERFORMANCE VERIFICATION DATA

CERTIFICATION DATA

Dummy Serial Number: 009

Calibration Test Results Summary

Dummy Serial Number: 009

Pre-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all impact test requirements.
Shoulder Impact Test:	The shoulder passed all impact test requirements.
Rib Tests:	All ribs passed all impact test requirements.
Abdomen Test:	The abdomen passed all impact test requirements.
Lumbar Spine Test:	The lumbar spine passed all impact test requirements.
Pelvis Test:	The pelvis passed all impact test requirements.

MGA RESEARCH CORPORATION

HEAD DROP TEST

EUROSID 2 DUMMY

Date: 2/6/03

Dummy Serial Number: 009

Test Number: D03131

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.9
Relative Humidity (%)	10 – 70	18
Peak Resultant Acceleration	100 – 150 g's	137
Time of Max. Res. Acceleration	msec	2.3

TEST MEETS SPECIFICATIONS

Technician: _____

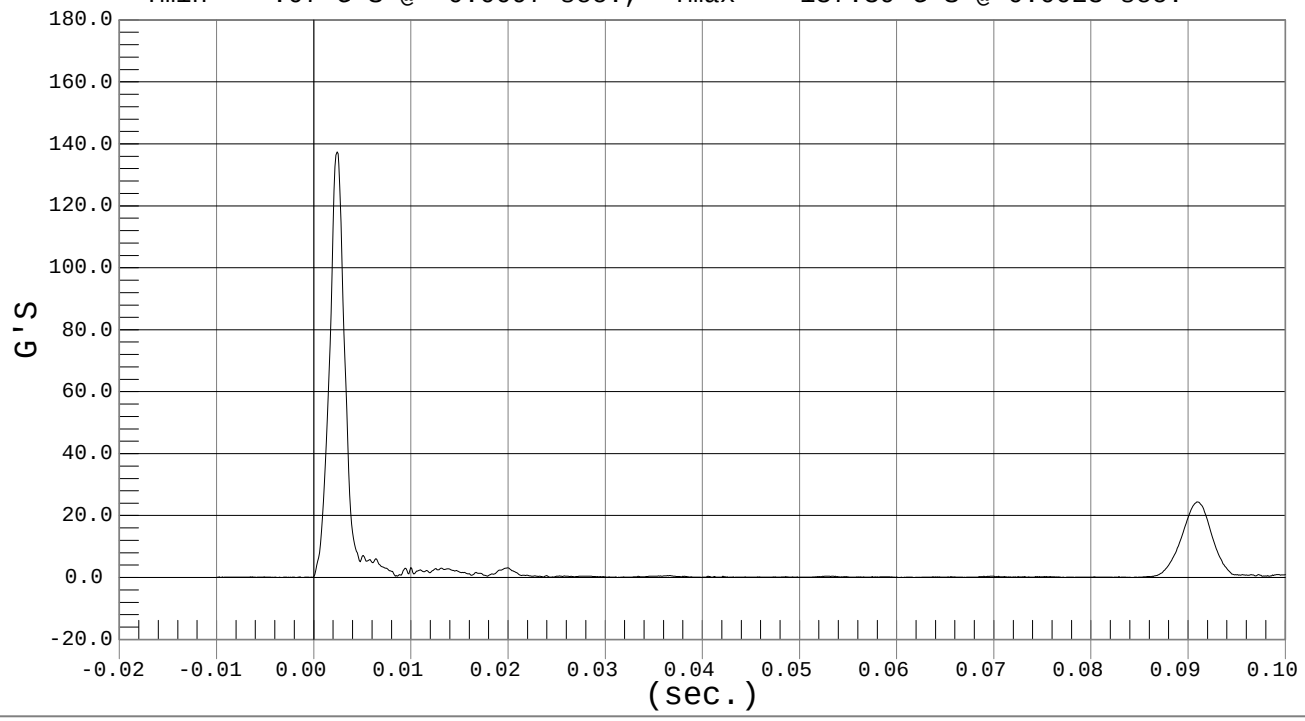
Approved By: _____

PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #009

Test Date: 02-06-03
Speed: 0.0 fps, 0.00 M/s

Ymin = .07 G'S @ -0.0097 sec., Ymax = 137.39 G'S @ 0.0023 sec.



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

EUROSID 2 DUMMY

Date: 2/6/03

Dummy Serial Number: 009

Test Number: D03132

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.9
Relative Humidity (%)		10 – 70	19
Pendulum Speed		3.3 - 3.5	3.4
Pendulum Deceleration	3 msec	¯.25 - ¯.53 m/sec	-.34
	8 msec	¯1.59 - ¯2.04 m/sec	-1.71
	14 msec	¯3.20 - ¯3.85 m/sec	-3.39
Maximum Flexion Angle		49.0 – 59.0 deg	58.5
Time of Max. Flexion Angle		54.0 – 66.0 ms	59.5
Maximum Angle Theta (A)		32.0 – 37.0 deg	36.6
Time of Max. Theta (A)		53.0 – 63.0 ms	60.1
Maximum Angle Theta (B)		31.40 – 33.90 deg	32.88
Time of Max. Theta (B)		54.0 – 64.0 ms	57.1

TEST MEETS SPECIFICATIONS

Technician: _____

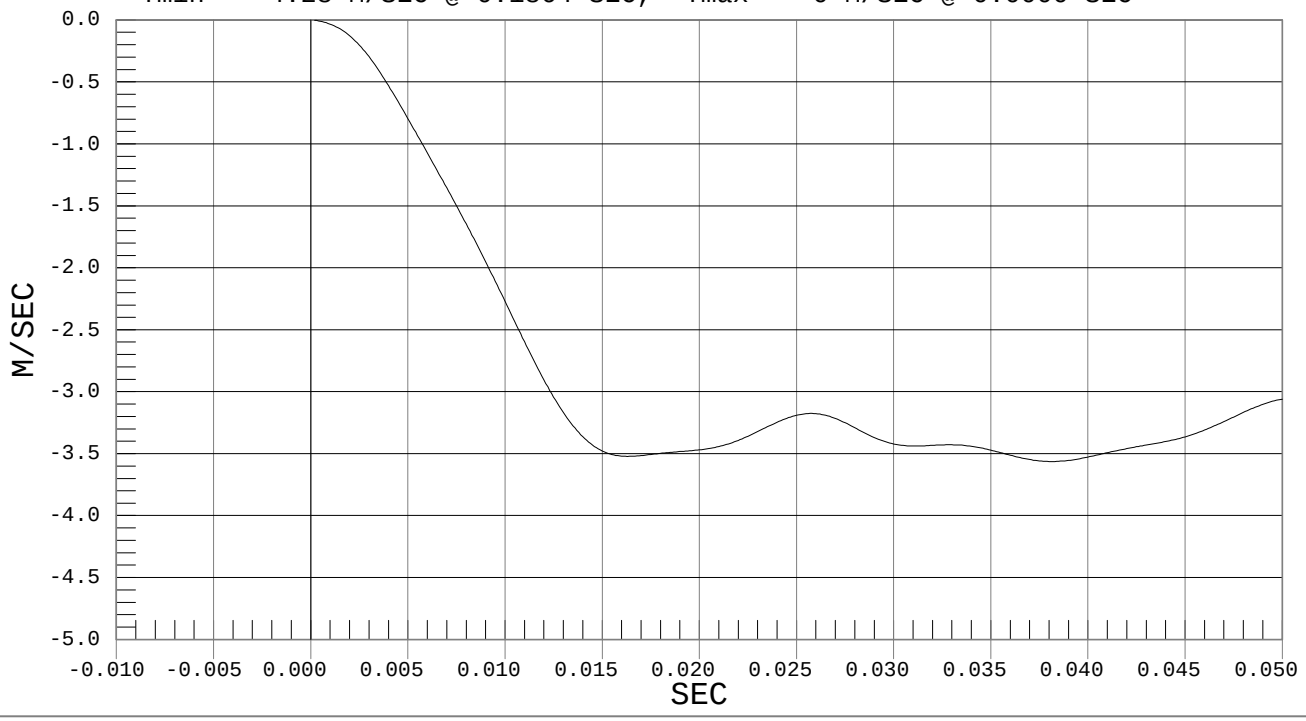
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 02-06-03
Speed: 11.3 fps, 3.43 M/s

Ymin = -4.28 M/SEC @ 0.1864 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

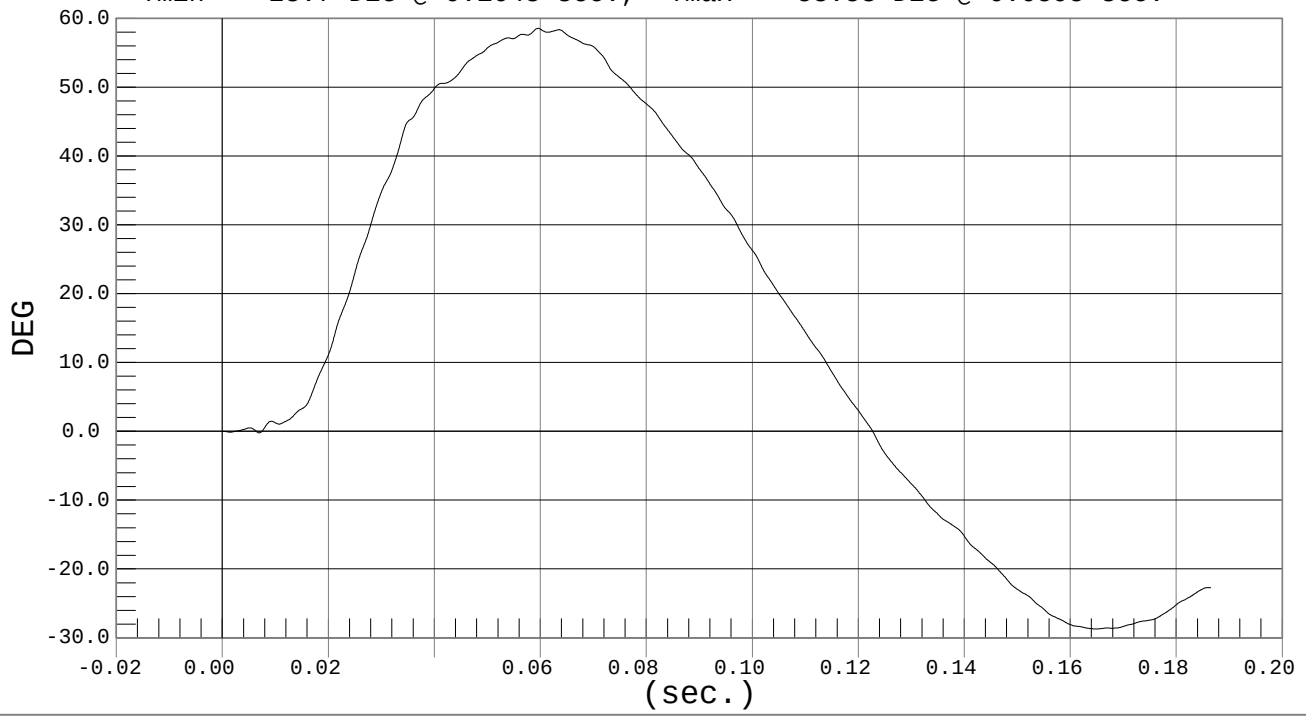


FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 02-06-03
Speed: 11.3 fps, 3.43 M/s

Ymin = -28.7 DEG @ 0.1648 sec., Ymax = 58.53 DEG @ 0.0595 sec.

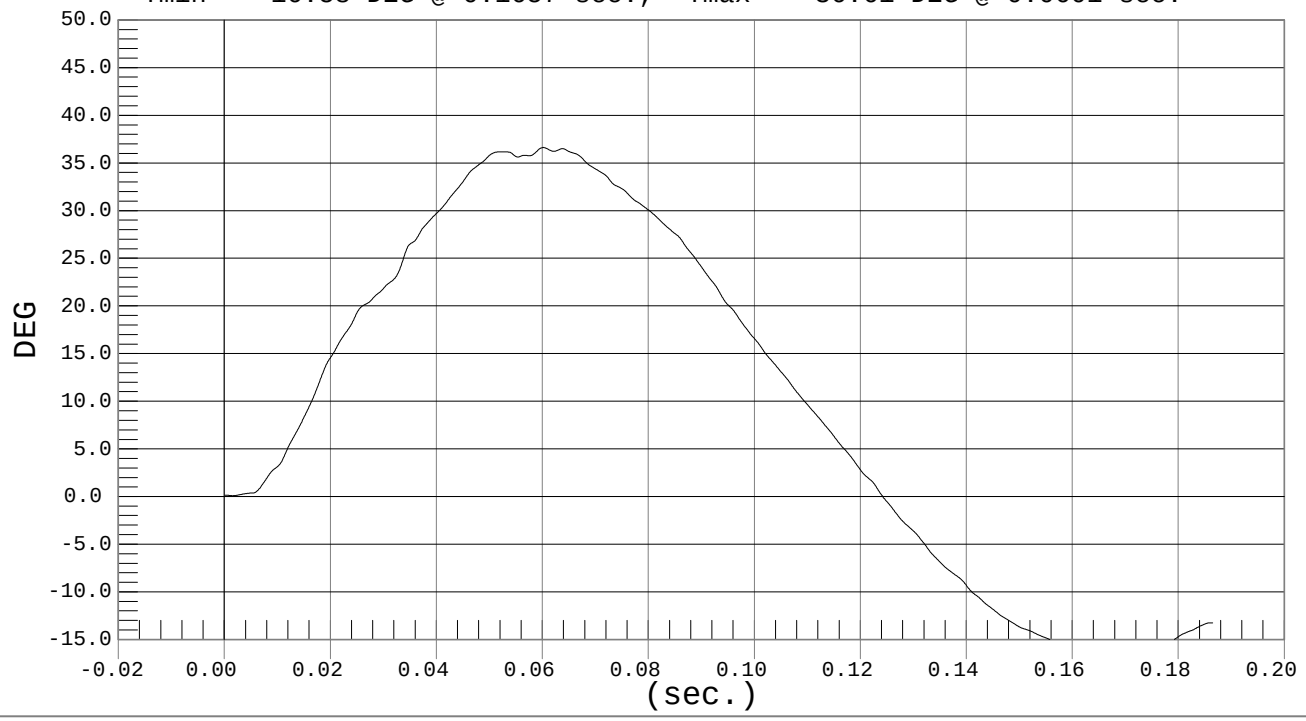


THETA A

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 02-06-03
Speed: 11.3 fps, 3.43 M/s

Ymin = -16.58 DEG @ 0.1657 sec., Ymax = 36.61 DEG @ 0.0601 sec.

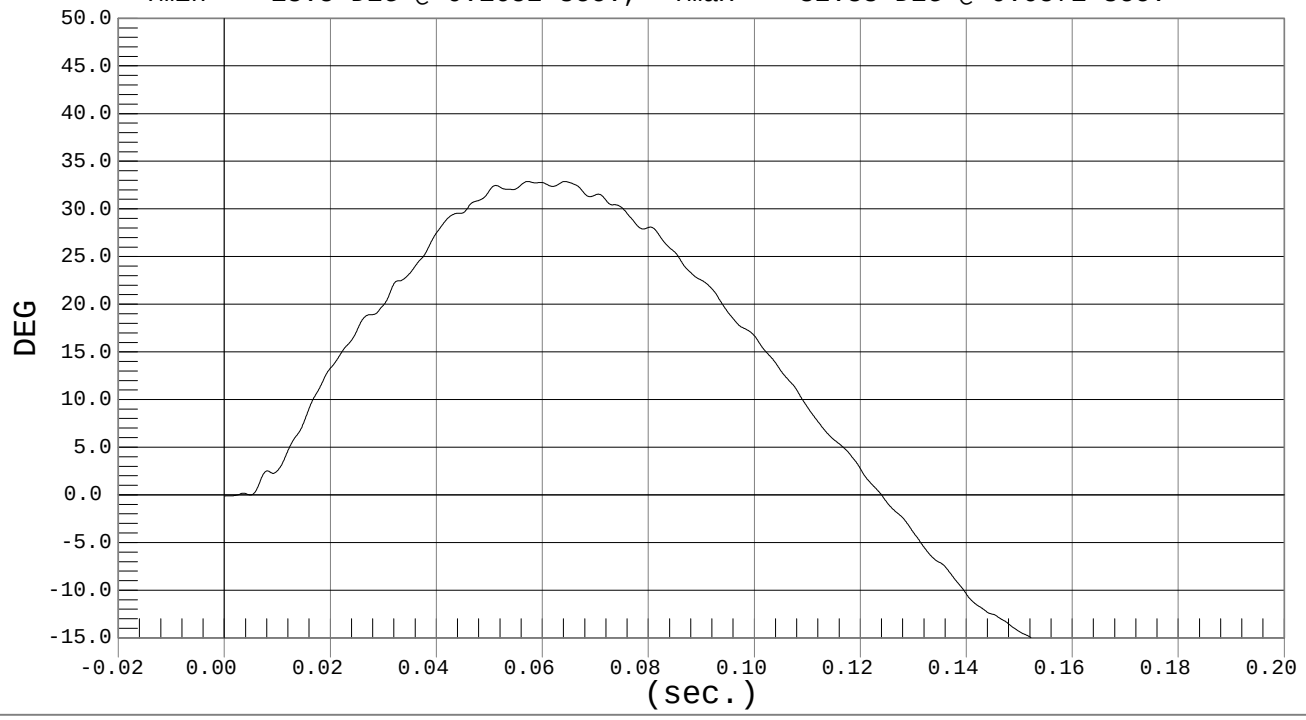


THETA B

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 02-06-03
Speed: 11.3 fps, 3.43 M/s

Ymin = -18.5 DEG @ 0.1652 sec., Ymax = 32.88 DEG @ 0.0571 sec.



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

EUROSID 2 DUMMY

Date: 2/6/03

Dummy Serial Number: 009

Test Number: D03133

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	21.1
Relative Humidity (%)	10 – 70	18
Pendulum Speed	4.2 – 4.4 m/s	4.3
Max. Resultant Acceleration	7.5 – 10.5 g's	9.7
Time of Max. Pendulum Acceleration	msec	11.9

TEST MEETS SPECIFICATIONS

Technician: _____

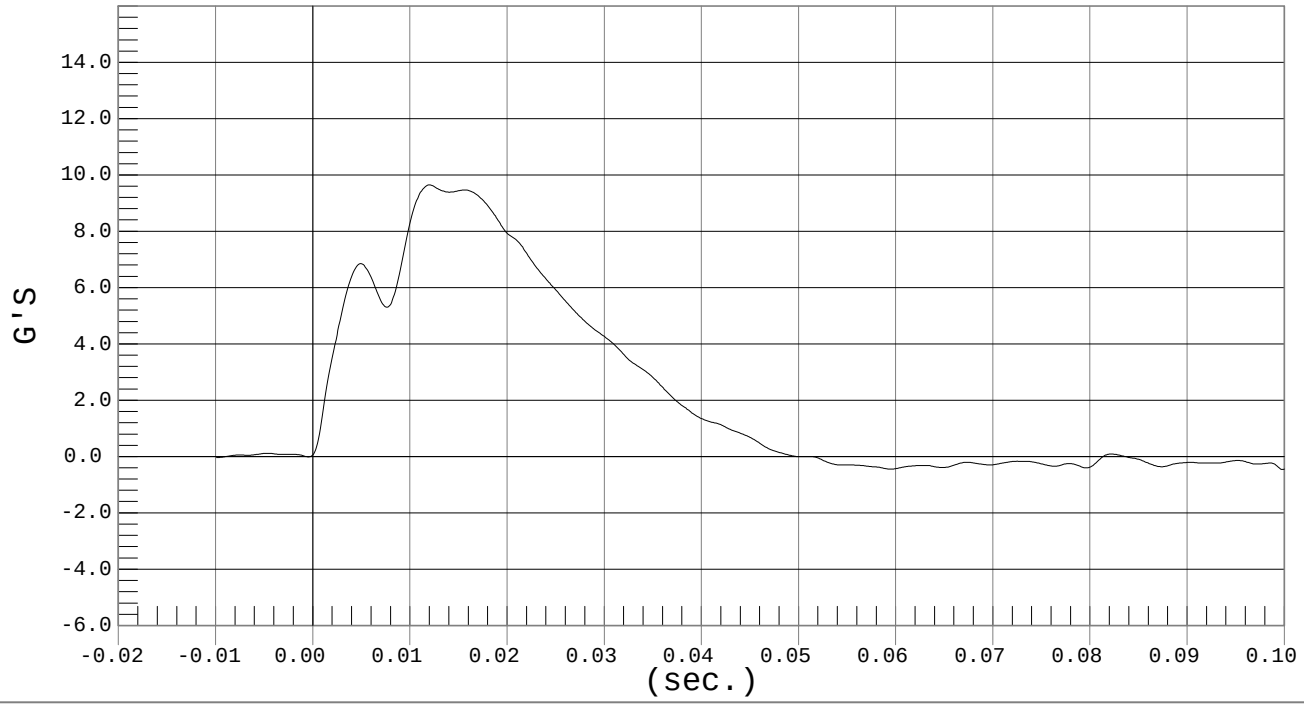
Approved By: _____

SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #009

Test Date: 02-06-03
Speed: 14.0 fps, 4.27 M/s

Ymin = -.6 G'S @ 0.1087 sec., Ymax = 9.65 G'S @ 0.0119 sec.



MGA RESEARCH CORPORATION

UPPER/MIDDLE/LOWER RIB TESTS

EUROSID 2 DUMMY

Date: 2/6/03

Dummy Serial Number: 009

Test Number: D03134/5/6

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.9
Relative Humidity (%)	10 – 70	19
Displacement at 2 m/s	23.5 – 27.5 mm	24.9
Displacement at 3 m/s	36.0 – 40.0 mm	37.3
Displacement at 4 m/s	46.0 – 51.0 mm	48.4

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.9
Relative Humidity (%)	10 – 70	19
Displacement at 2 m/s	23.5 – 27.5 mm	25.3
Displacement at 3 m/s	36.0 – 40.0 mm	37.0
Displacement at 4 m/s	46.0 – 51.0 mm	48.2

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.9
Relative Humidity (%)	10 – 70	19
Displacement at 2 m/s	23.5 – 27.5 mm	24.9
Displacement at 3 m/s	36.0 – 40.0 mm	37.4
Displacement at 4 m/s	46.0 – 51.0 mm	48.5

TEST MEETS SPECIFICATIONS

Technician: _____

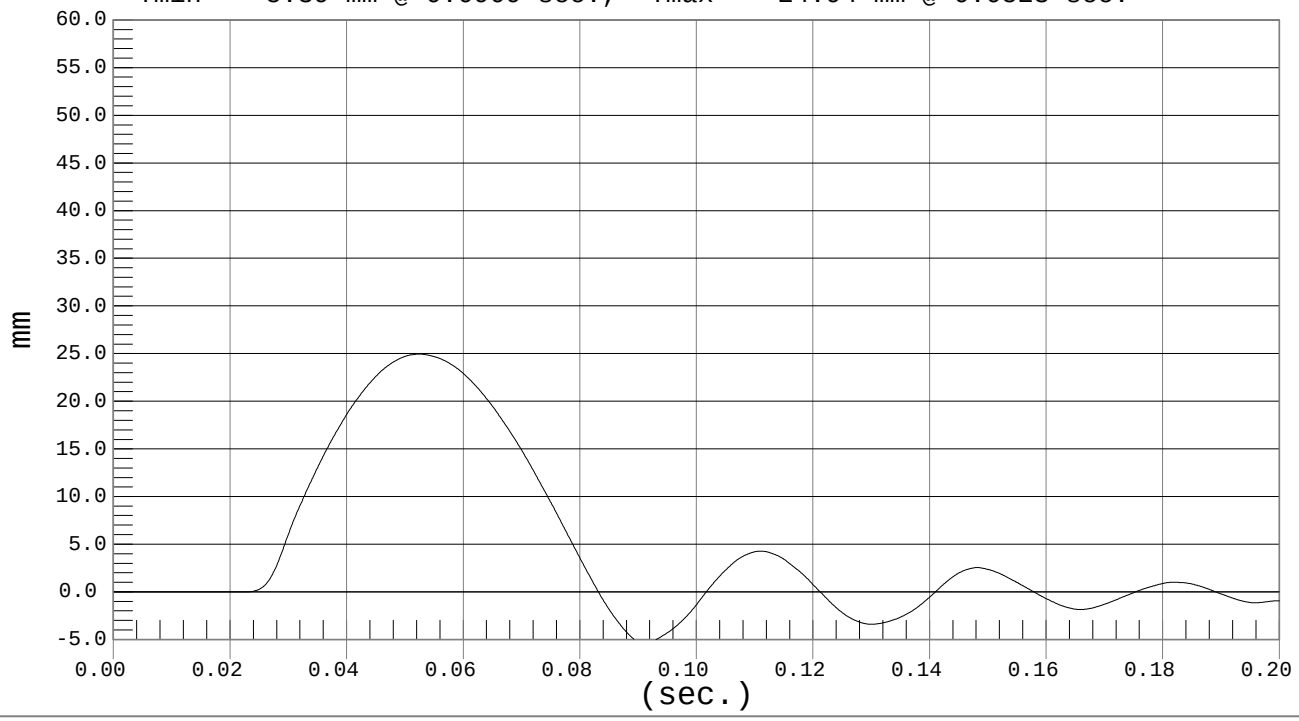
Approved By: _____

UPPER RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 02-06-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.39 mm @ 0.0909 sec., Ymax = 24.94 mm @ 0.0523 sec.

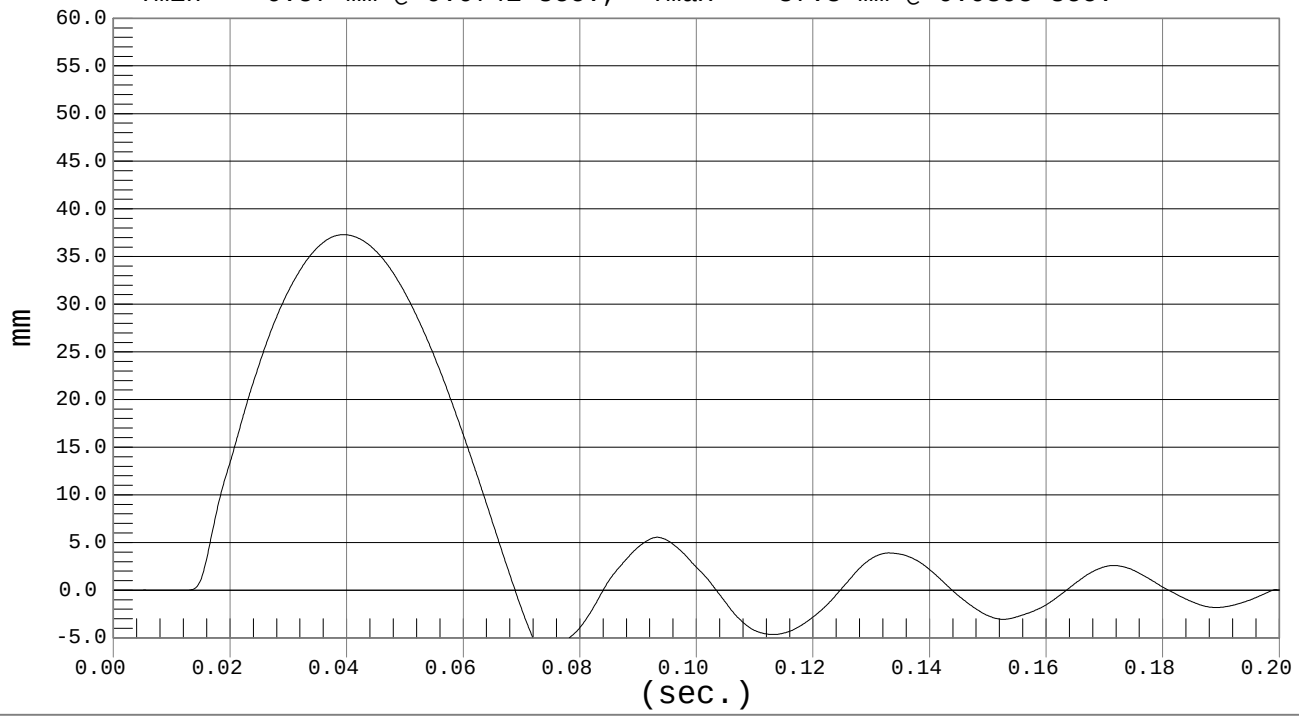


UPPER RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 02-06-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -6.57 mm @ 0.0741 sec., Ymax = 37.3 mm @ 0.0395 sec.

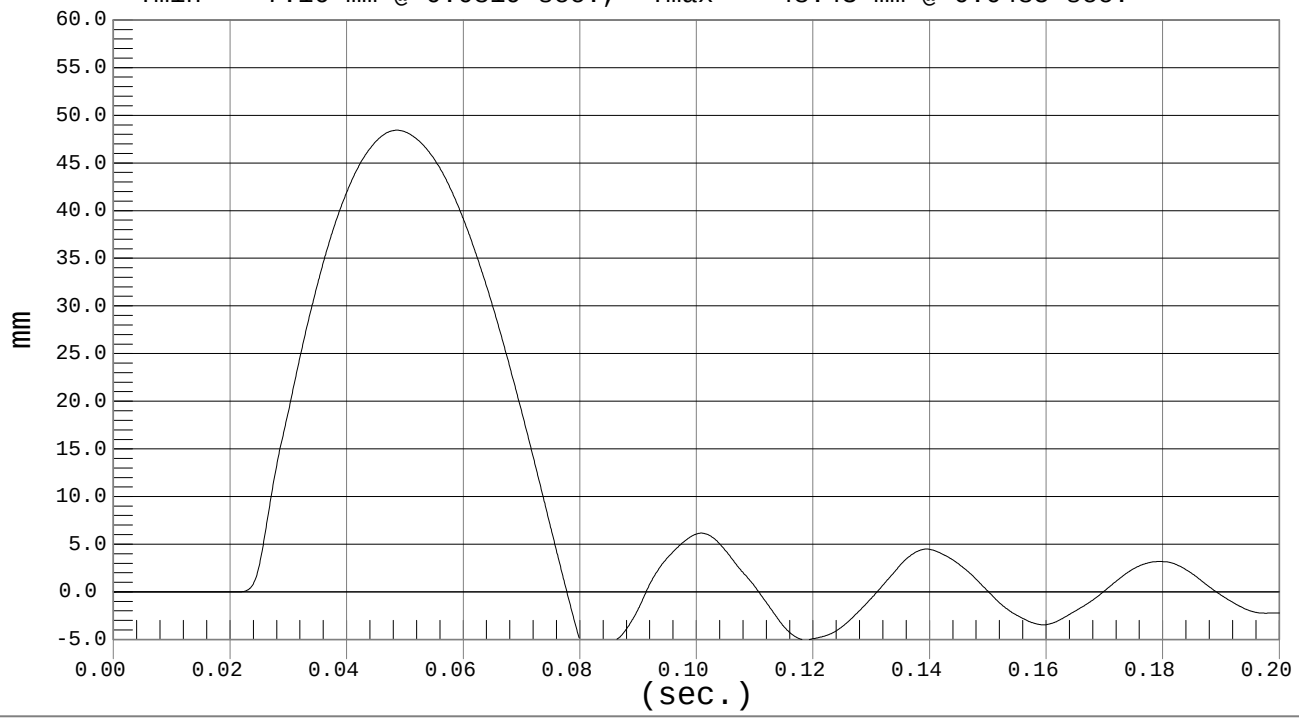


UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 02-06-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -7.16 mm @ 0.0819 sec., Ymax = 48.43 mm @ 0.0485 sec.

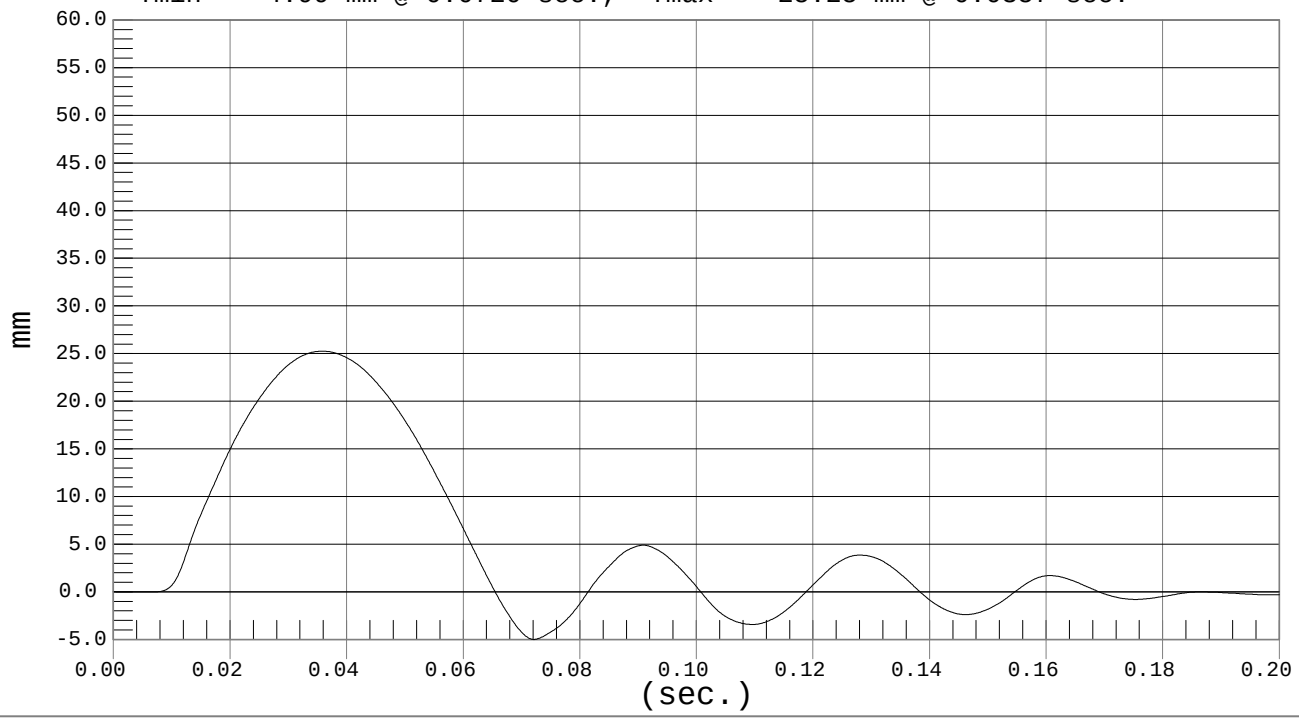


MIDDLE RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 02-06-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -4.99 mm @ 0.0720 sec., Ymax = 25.25 mm @ 0.0357 sec.

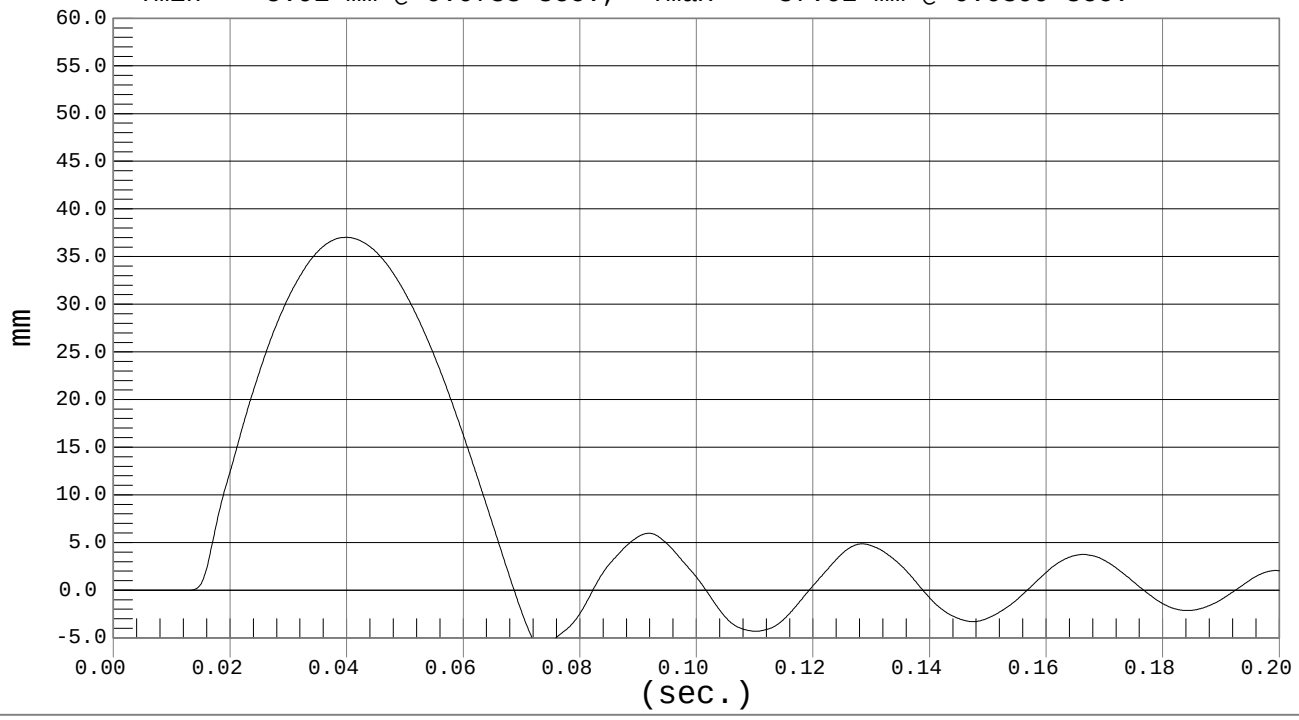


MIDDLE RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 02-06-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -5.91 mm @ 0.0733 sec., Ymax = 37.02 mm @ 0.0399 sec.

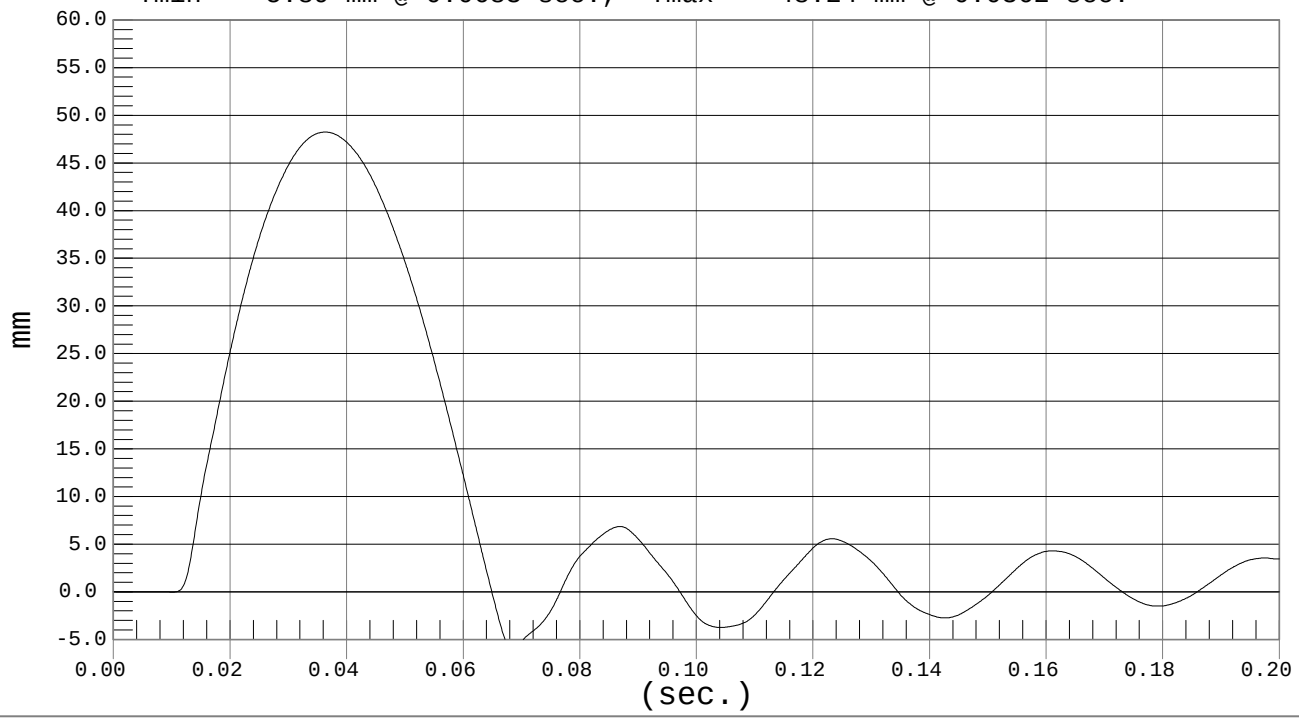


MIDDLE RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 02-06-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -5.89 mm @ 0.0683 sec., Ymax = 48.24 mm @ 0.0362 sec.

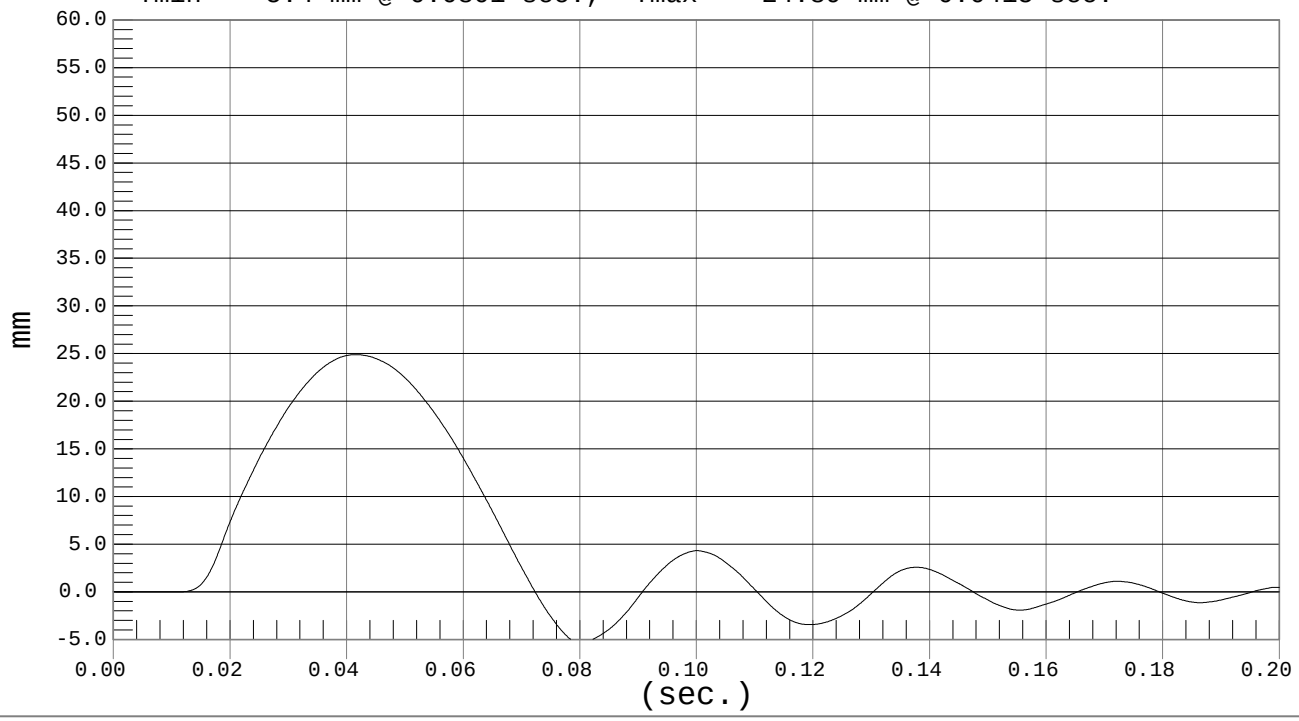


LOWER RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 02-06-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.4 mm @ 0.0801 sec., Ymax = 24.89 mm @ 0.0415 sec.

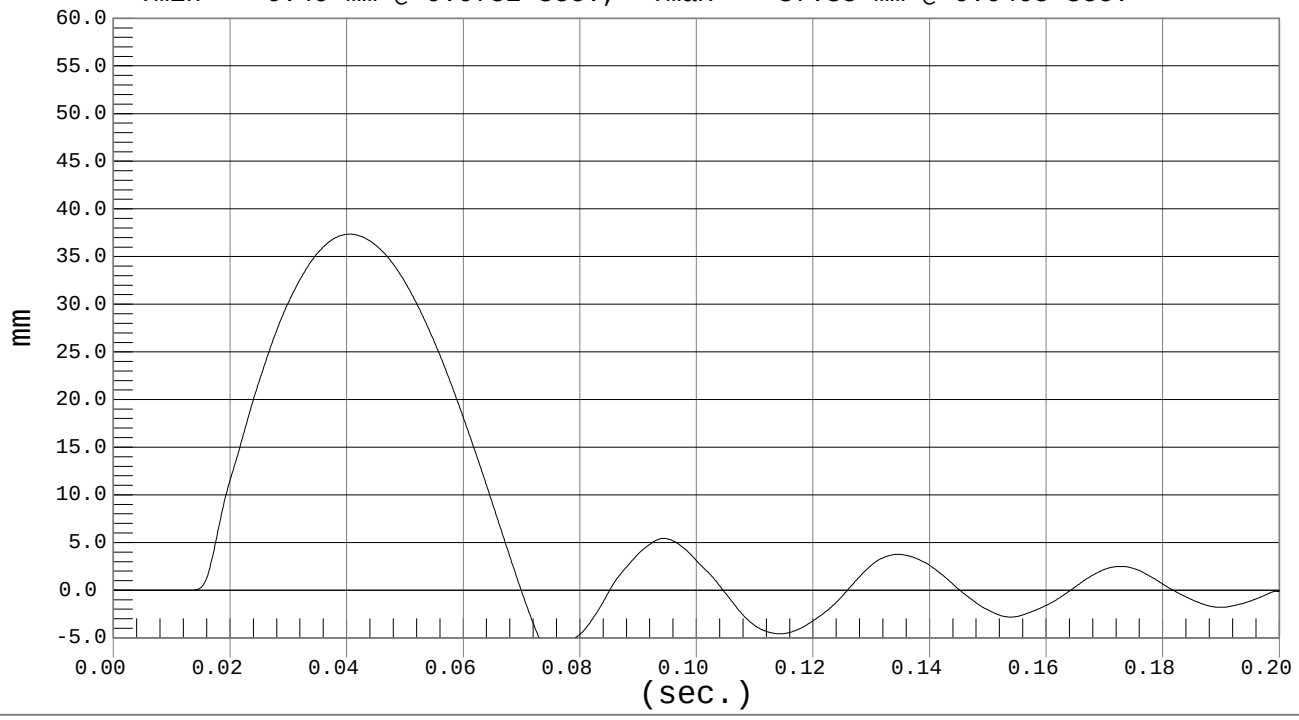


LOWER RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 02-06-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -6.49 mm @ 0.0752 sec., Ymax = 37.35 mm @ 0.0405 sec.

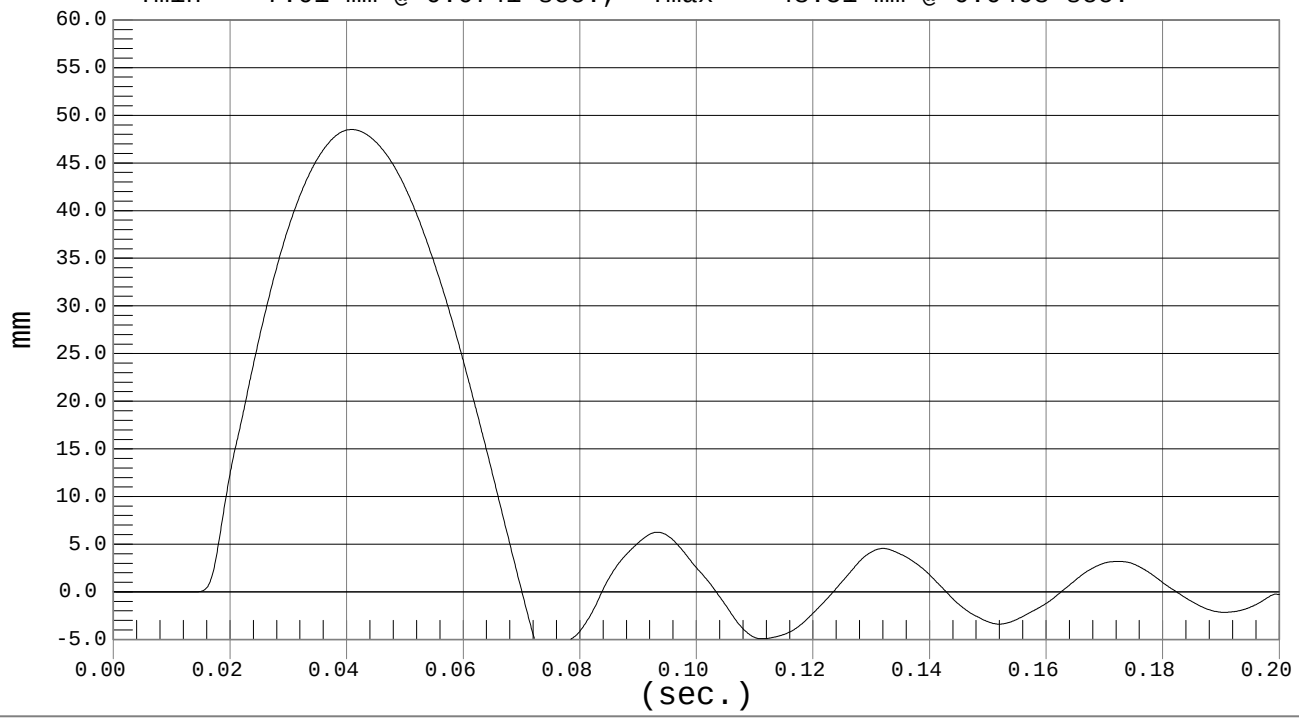


LOWER RIB DISPLACEMENT

Test Desc.: RIB MODULE
Component: Dummy #009

Test Date: 02-06-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -7.01 mm @ 0.0741 sec., Ymax = 48.51 mm @ 0.0408 sec.



MGA RESEARCH CORPORATION

ABDOMEN TEST

EUROSID 2 DUMMY

Date: 2/6/03

Dummy Serial Number: 009

Test Number: D03137

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.8
Relative Humidity (%)	10 – 70	18
Probe Speed (m/s)	3.90 – 4.10	3.92
Maximum Impact Force	4.00 – 4.80 kN	4.15
Time of Maximum Force	10.60 – 13.00 ms	10.60
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.38
Time of Max. Total Force	10.00 – 12.30 ms	10.30

TEST MEETS SPECIFICATIONS

Technician: _____

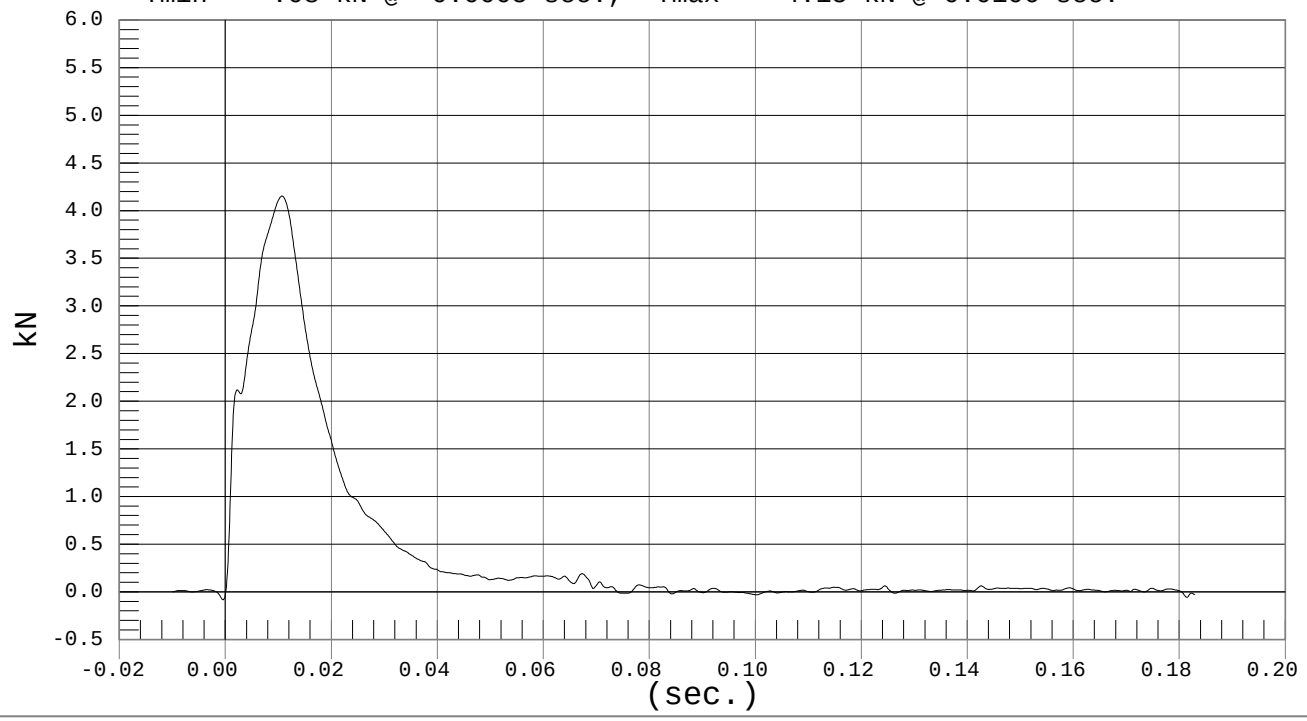
Approved By: _____

IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 02-06-03
Speed: 12.9 fps, 3.92 M/s

Ymin = -.08 kN @ -0.0005 sec., Ymax = 4.15 kN @ 0.0106 sec.

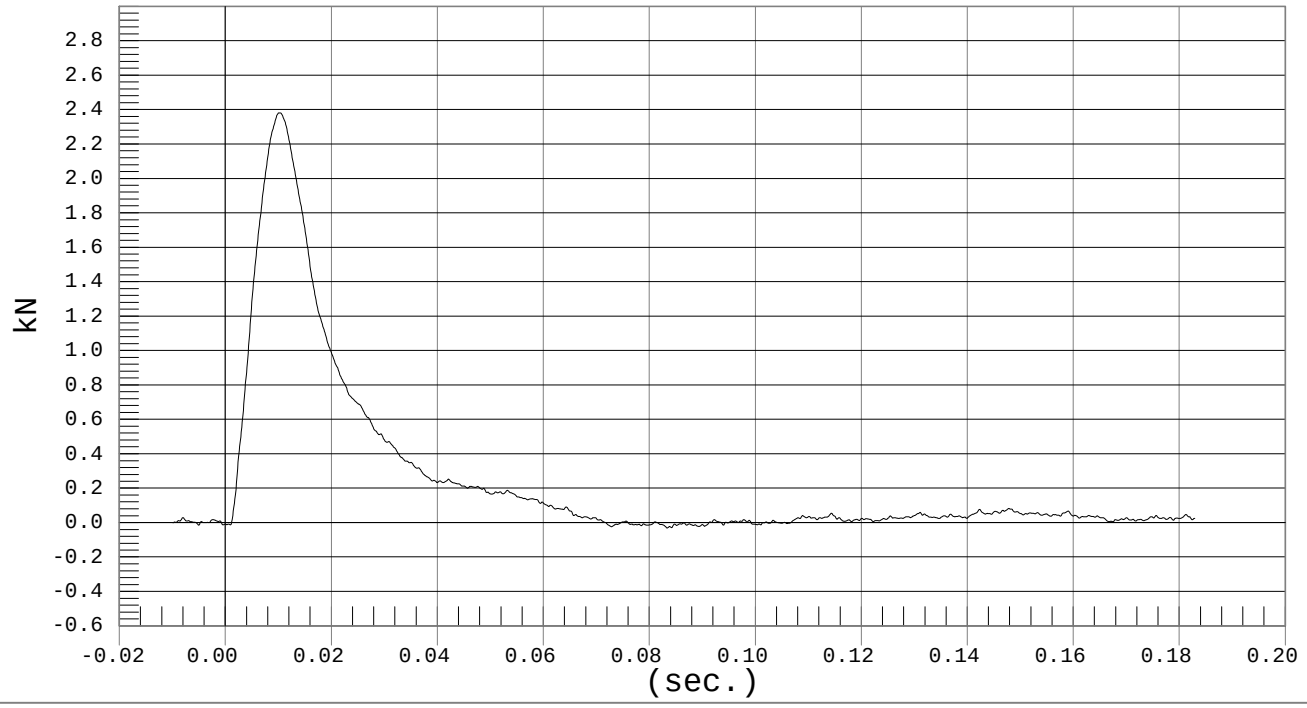


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 02-06-03
Speed: 12.9 fps, 3.92 M/s

Ymin = -.03 kN @ 0.0833 sec., Ymax = 2.38 kN @ 0.0103 sec.



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

EUROSID 2 DUMMY

Date: 2/6/03

Dummy Serial Number: 009

Test Number: D03138

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.9
Relative Humidity (%)		10 – 70	19
Pendulum Speed		5.95 – 6.15	6.05
Pendulum Deceleration	10 msec	-2.46 - -1.59 m/sec	-1.88
	20 msec	-5.25 - -4.07 m/sec	-4.31
	25 msec	-6.64 - -5.30 m/sec	-5.45
	30 msec	≥ -6.5 m/sec	-6.16
Maximum Flexion Angle		45.0 – 55.0 deg	48.9
Time of Max. Flexion Angle		39.0 – 53.0 ms	44.8
Maximum Angle Theta (A)		31.0 – 35.0 deg	31.2
Time of Max. Theta (A)		44.0 – 52.0 ms	44.8
Maximum Angle Theta (B)		26.96– 29.46 deg	27.79
Time of Max. Theta (B)		44.0 – 52.0 ms	44.3

TEST MEETS SPECIFICATIONS

Technician: _____

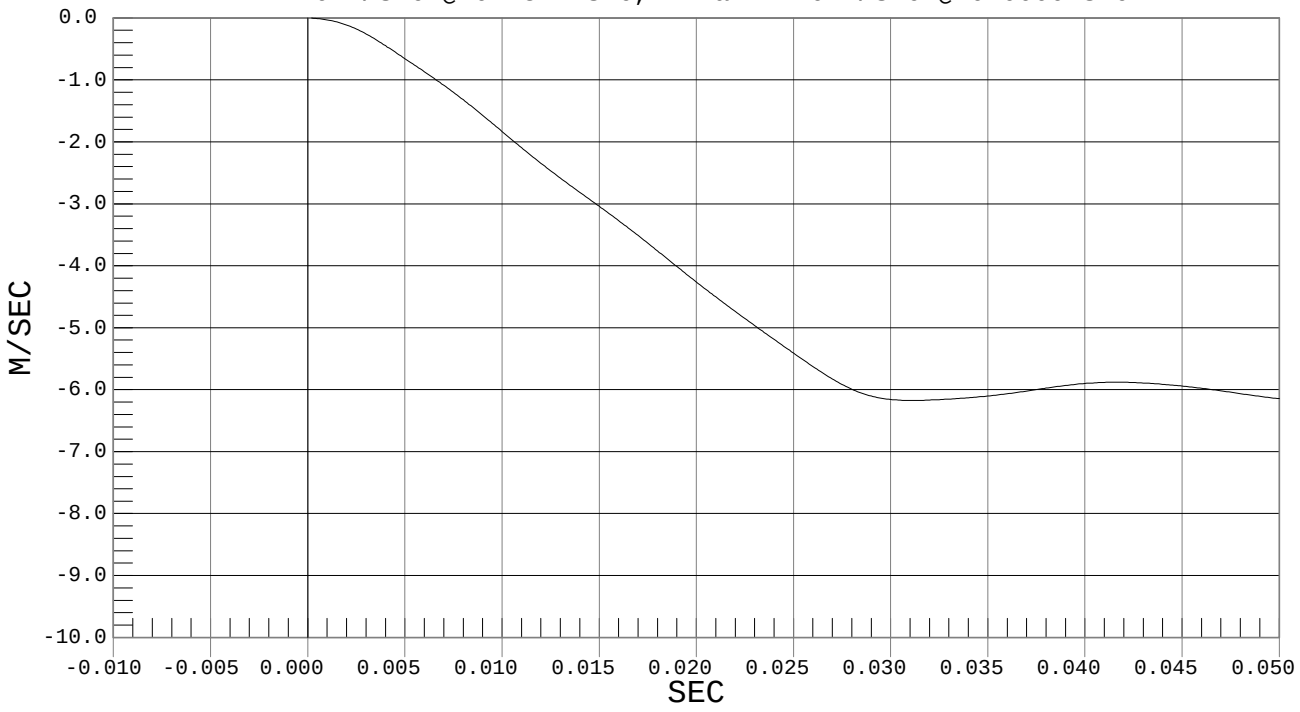
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 02-06-03
Speed: 19.9 fps, 6.05 M/s

Ymin = -7.46 M/SEC @ 0.1371 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

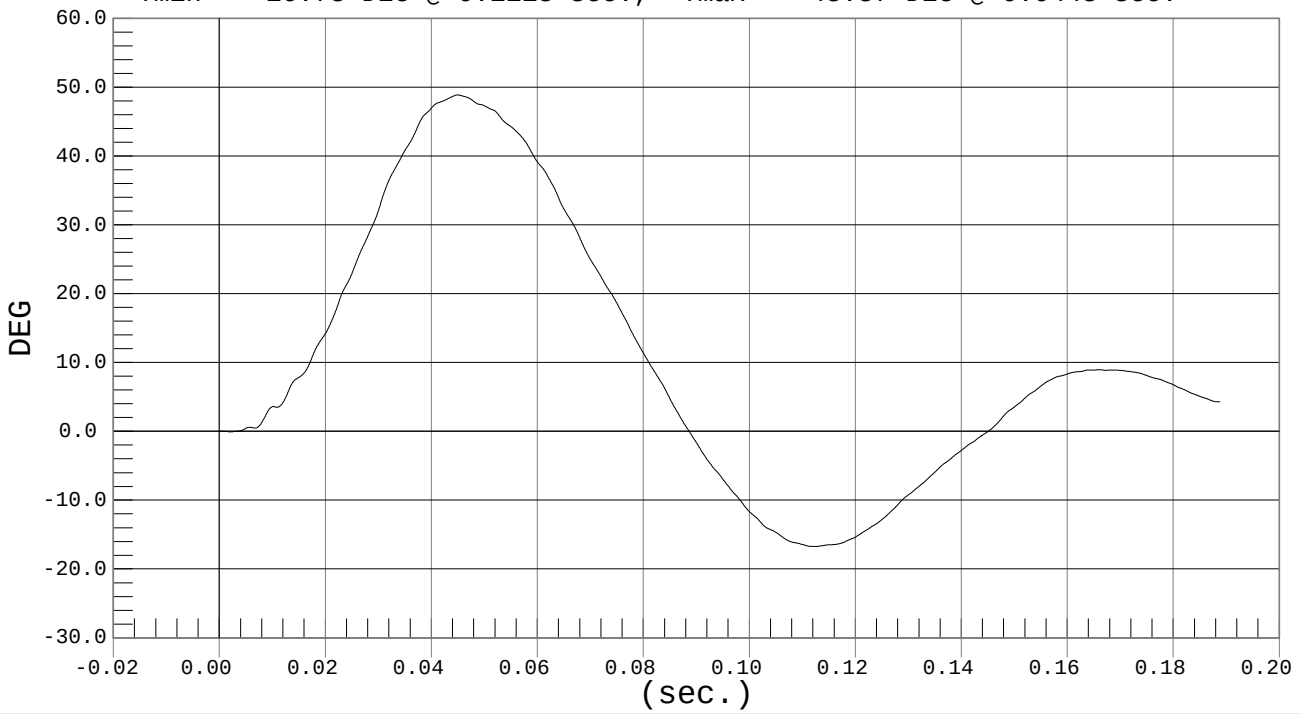


FLEXION ANGLE

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 02-06-03
Speed: 19.9 fps, 6.05 M/s

Ymin = -16.73 DEG @ 0.1118 sec., Ymax = 48.87 DEG @ 0.0448 sec.

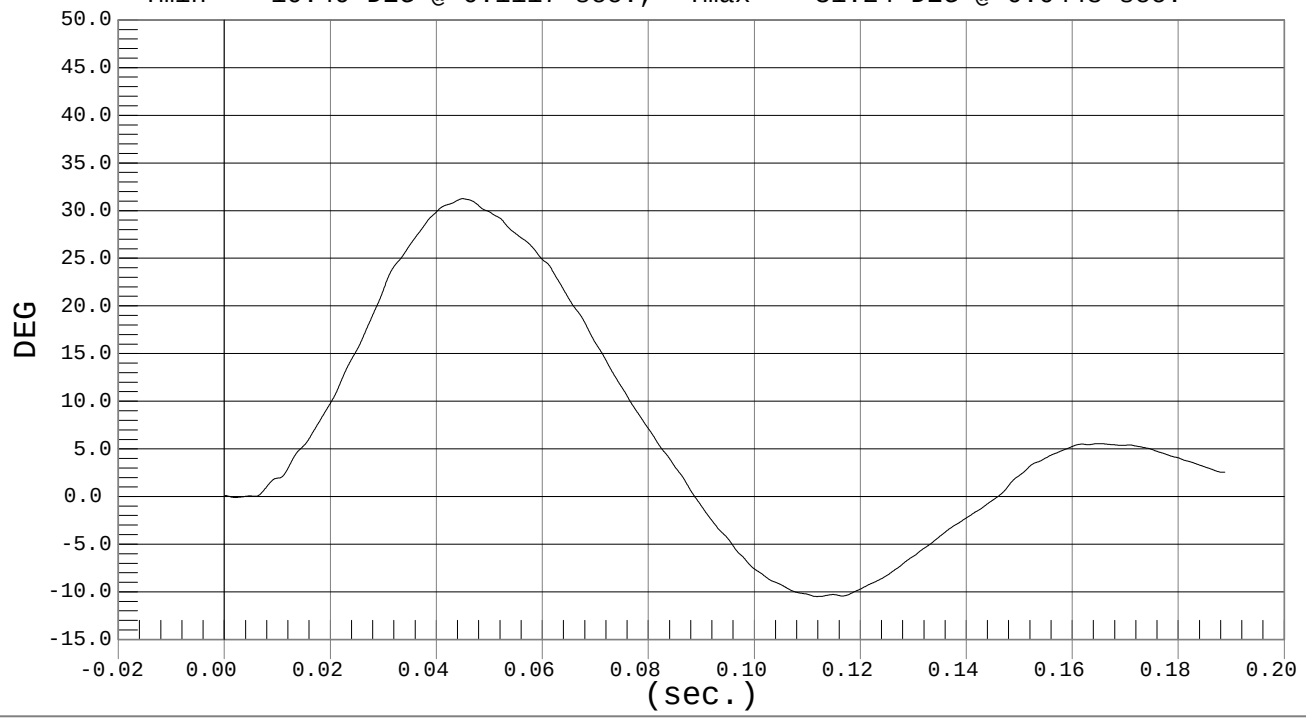


THETA A

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 02-06-03
Speed: 19.9 fps, 6.05 M/s

Ymin = -10.49 DEG @ 0.1117 sec., Ymax = 31.24 DEG @ 0.0448 sec.

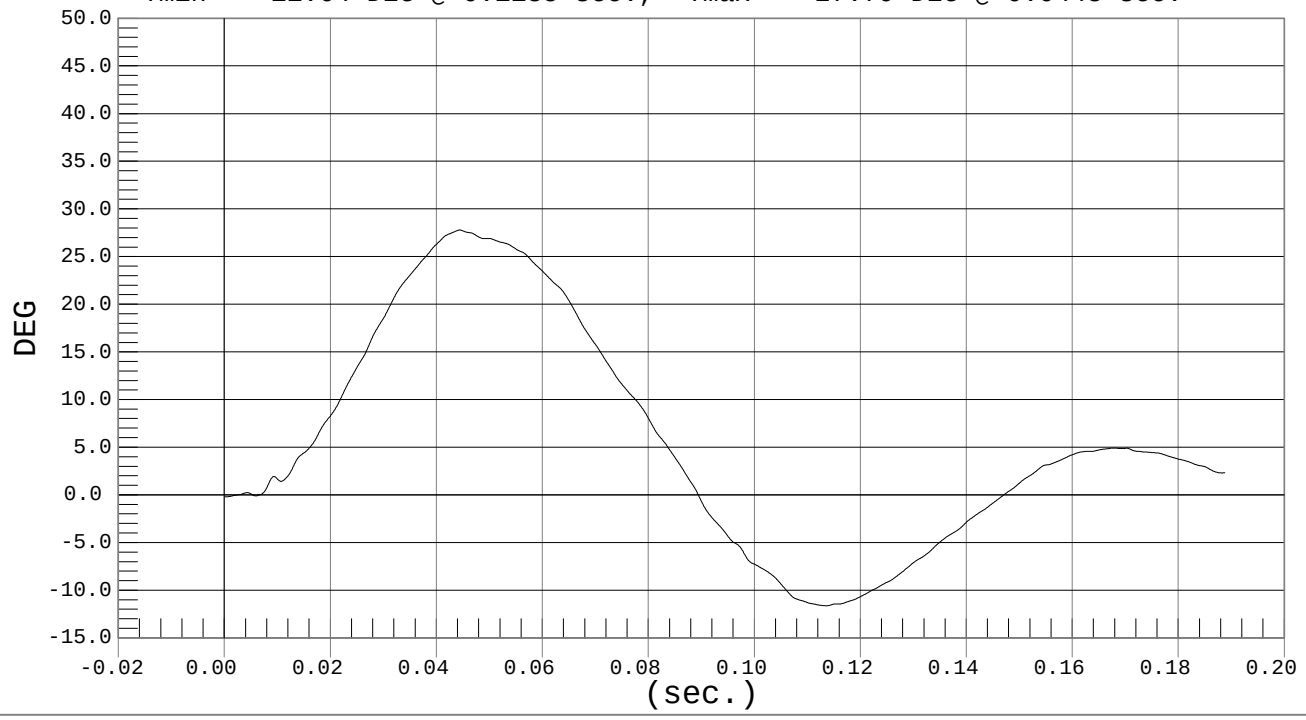


THETA B

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 02-06-03
Speed: 19.9 fps, 6.05 M/s

Ymin = -11.64 DEG @ 0.1135 sec., Ymax = 27.79 DEG @ 0.0443 sec.



MGA RESEARCH CORPORATION

PELVIS TEST

EUROSID 2 DUMMY

Date: 2/6/03

Dummy Serial Number: 009

Test Number: D03139

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.6
Relative Humidity (%)	10 – 70	18
Pendulum Speed	4.20 – 4.40 m/s	4.28
Maximum Impactor Force	4.40 – 5.40 kN	4.64
Time of Max. Impactor Force	10.30 – 15.50 ms	14.10
Maximum Pubic Force	1.04 – 1.64 kN	1.39
Time of Max. Pubic Force	9.90 – 15.90 ms	14.50

TEST MEETS SPECIFICATIONS

Technician: _____

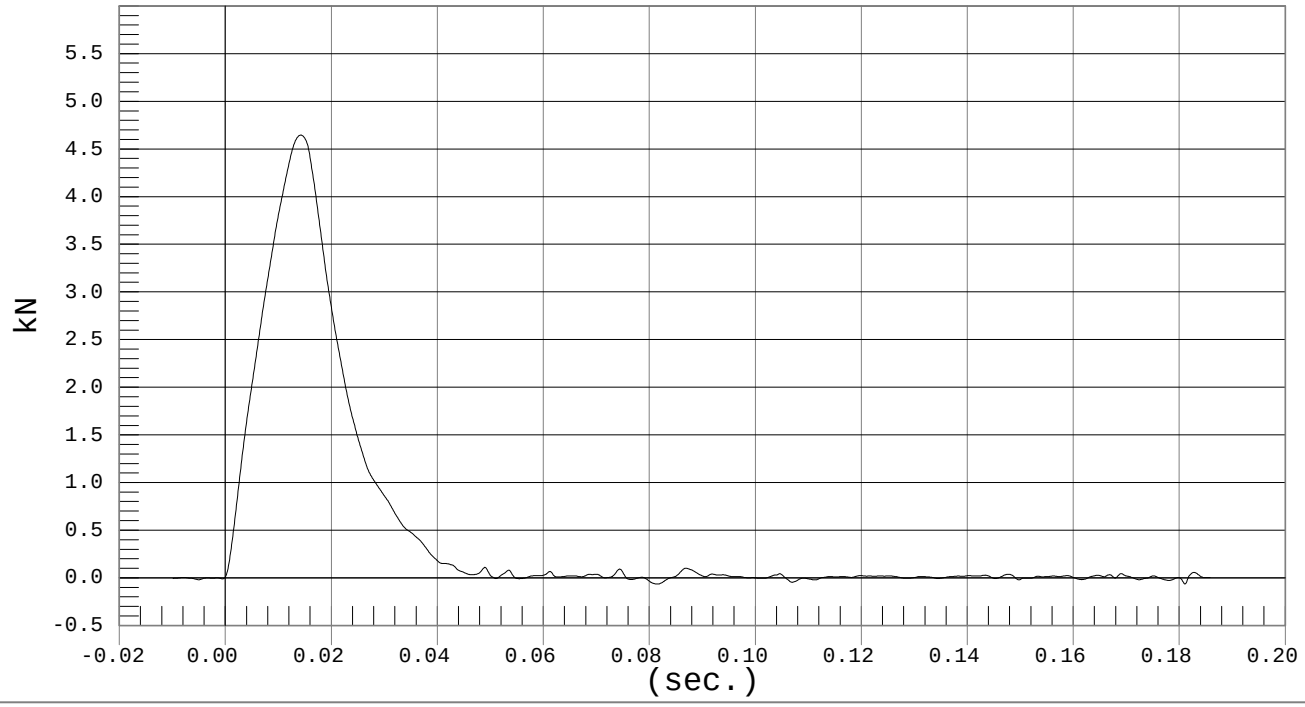
Approved By: _____

IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 02-06-03
Speed: 14.0 fps, 4.28 M/s

Ymin = -.07 kN @ 0.0814 sec., Ymax = 4.64 kN @ 0.0141 sec.

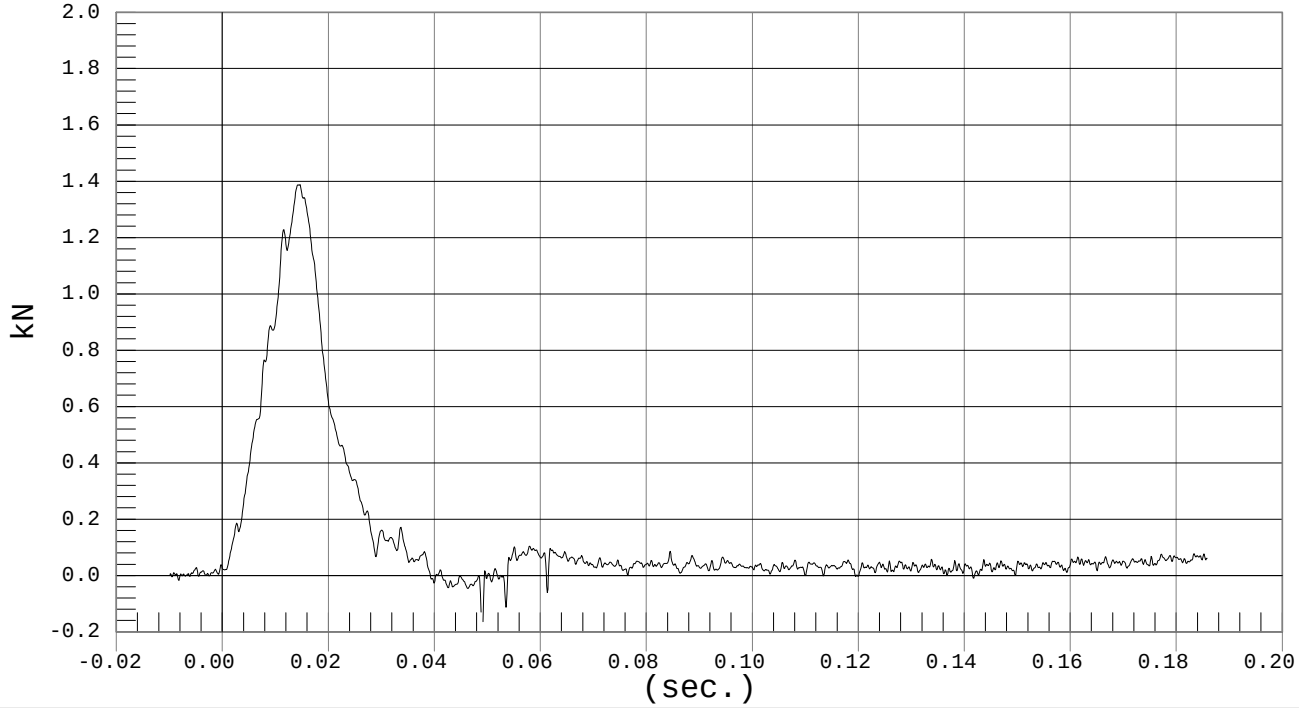


PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 02-06-03
Speed: 14.0 fps, 4.28 M/s

Ymin = -.25 kN @ 0.0489 sec., Ymax = 1.39 kN @ 0.0145 sec.



CERTIFICATION DATA

Dummy Serial Number: 009

Calibration Test Results Summary

Dummy Serial Number: 009

Post-Test Calibration

Head Drop Test:	The head passed all drop test requirements.
Neck Pendulum Test:	The neck passed all impact test requirements.
Shoulder Impact Test:	The shoulder passed all impact test requirements.
Rib Tests:	All ribs passed all impact test requirements.
Abdomen Test:	The abdomen passed all impact test requirements.
Lumbar Spine Test:	The lumbar spine passed all impact test requirements.
Pelvis Test:	The pelvis passed all impact test requirements.

MGA RESEARCH CORPORATION

HEAD DROP TEST

EUROSID 2 DUMMY

Date: 3/4/03

Dummy Serial Number: 009

Test Number: D03241

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.6
Relative Humidity (%)	10 – 70	21
Peak Resultant Acceleration	100 – 150 g's	129
Time of Max. Res. Acceleration	msec	25.5

TEST MEETS SPECIFICATIONS

Technician: _____

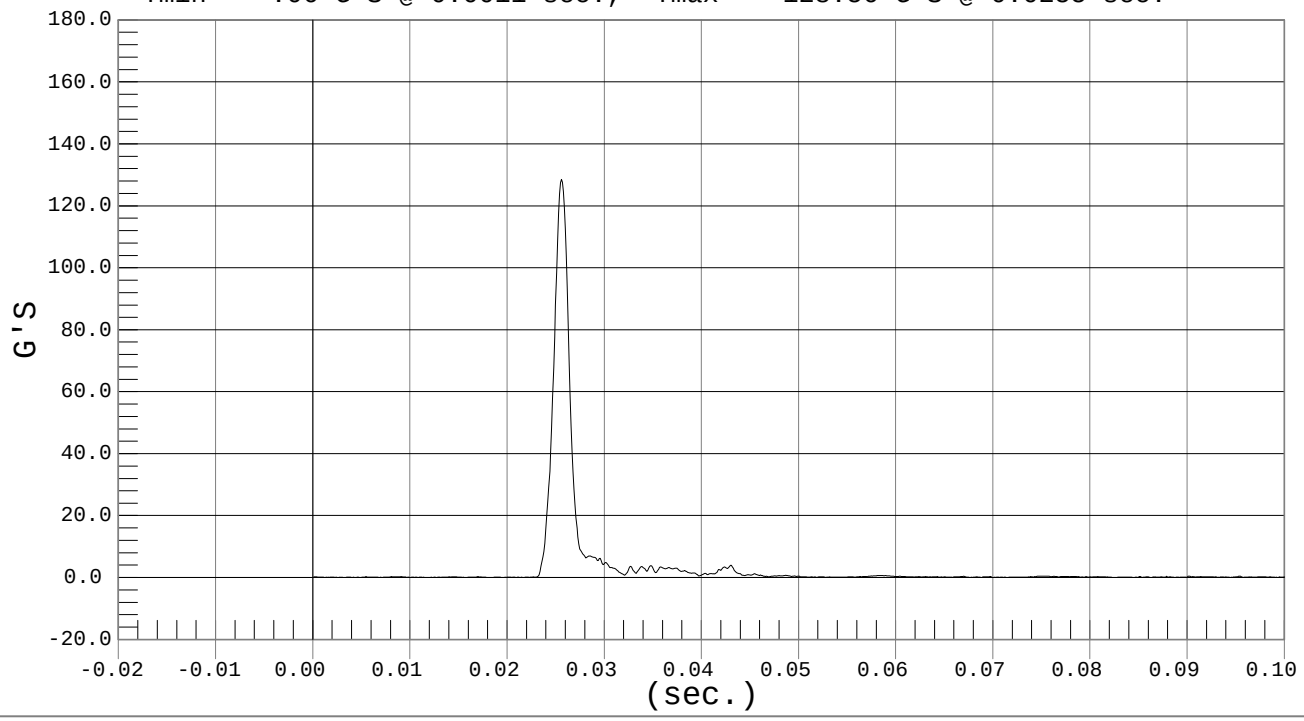
Approved By: _____

PEAK RESULTANT ACCELERATION

Test Desc.: Head Drop
Component: Dummy #009

Test Date: 03-04-03
Speed: 0.0 fps, 0.00 M/s

Ymin = .06 G'S @ 0.0011 sec., Ymax = 128.56 G'S @ 0.0255 sec.



MGA RESEARCH CORPORATION

NECK PENDULUM TEST

EUROSID 2 DUMMY

Date: 3/4/03

Dummy Serial Number: 009

Test Number: D03242

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.7
Relative Humidity (%)		10 – 70	23
Pendulum Speed		3.3 - 3.5	3.3
Pendulum Deceleration	3 msec	¯.25 - ¯.53 m/sec	-.35
	8 msec	¯1.59 - ¯2.04 m/sec	-1.75
	14 msec	¯3.20 - ¯3.85 m/sec	-3.42
Maximum Flexion Angle		49.0 – 59.0 deg	58.1
Time of Max. Flexion Angle		54.0 – 66.0 ms	57.7
Maximum Angle Theta (A)		32.0 – 37.0 deg	35.9
Time of Max. Theta (A)		53.0 – 63.0 ms	54.3
Maximum Angle Theta (B)		30.83 – 33.33 deg	32.88
Time of Max. Theta (B)		54.0 – 64.0 ms	59.3

TEST MEETS SPECIFICATIONS

Technician: _____

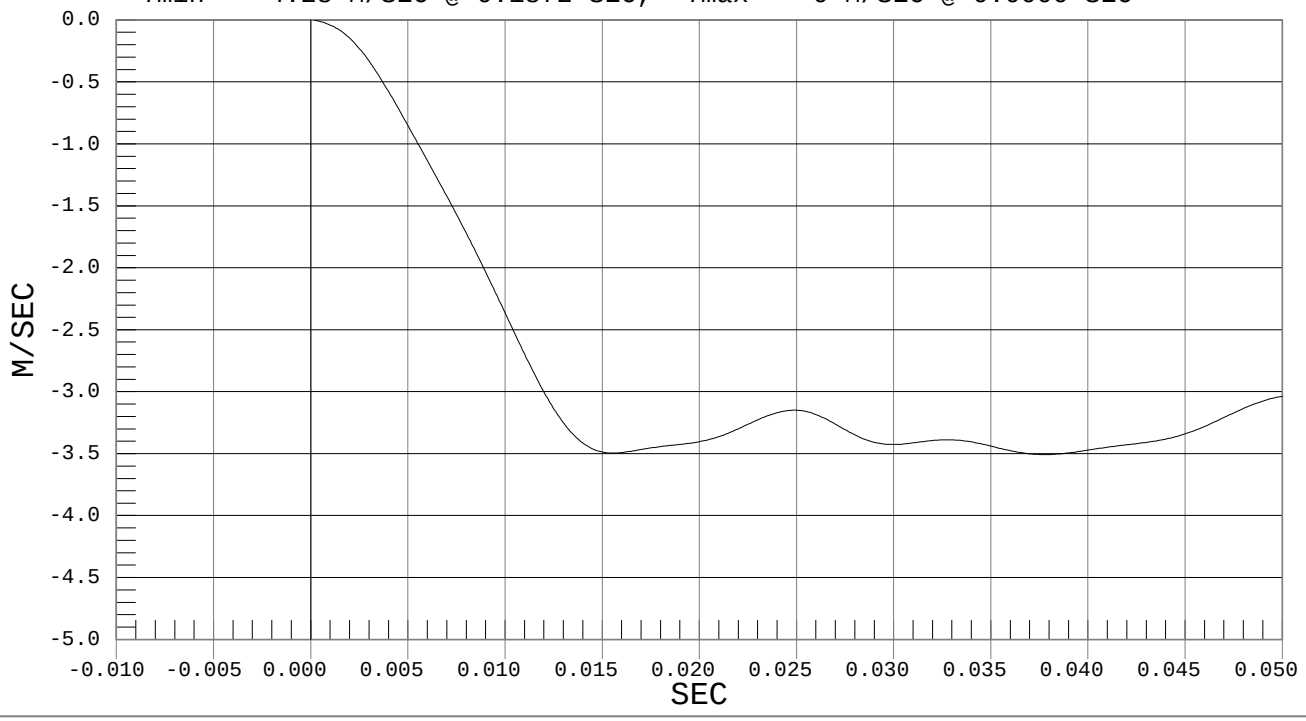
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 03-04-03
Speed: 11.0 fps, 3.34 M/s

Ymin = -4.28 M/SEC @ 0.1872 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

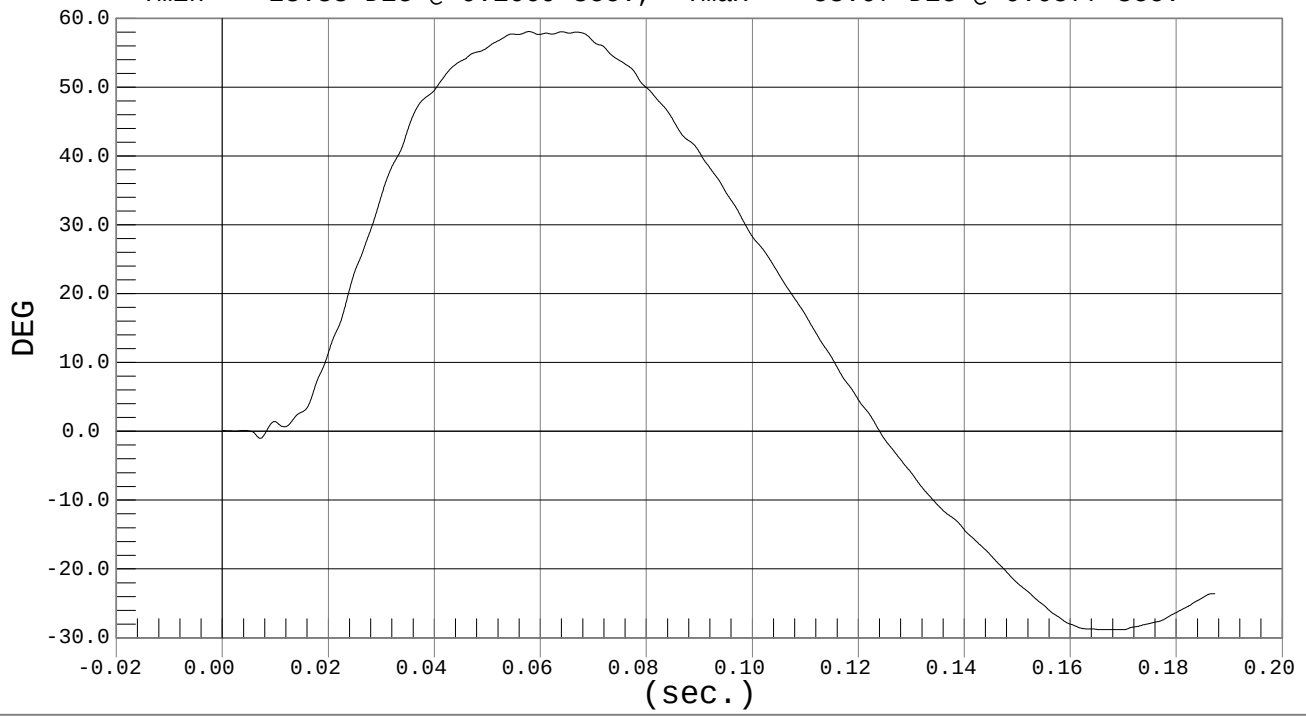


FLEXION ANGLE

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 03-04-03
Speed: 11.0 fps, 3.34 M/s

Ymin = -28.83 DEG @ 0.1669 sec., Ymax = 58.07 DEG @ 0.0577 sec.

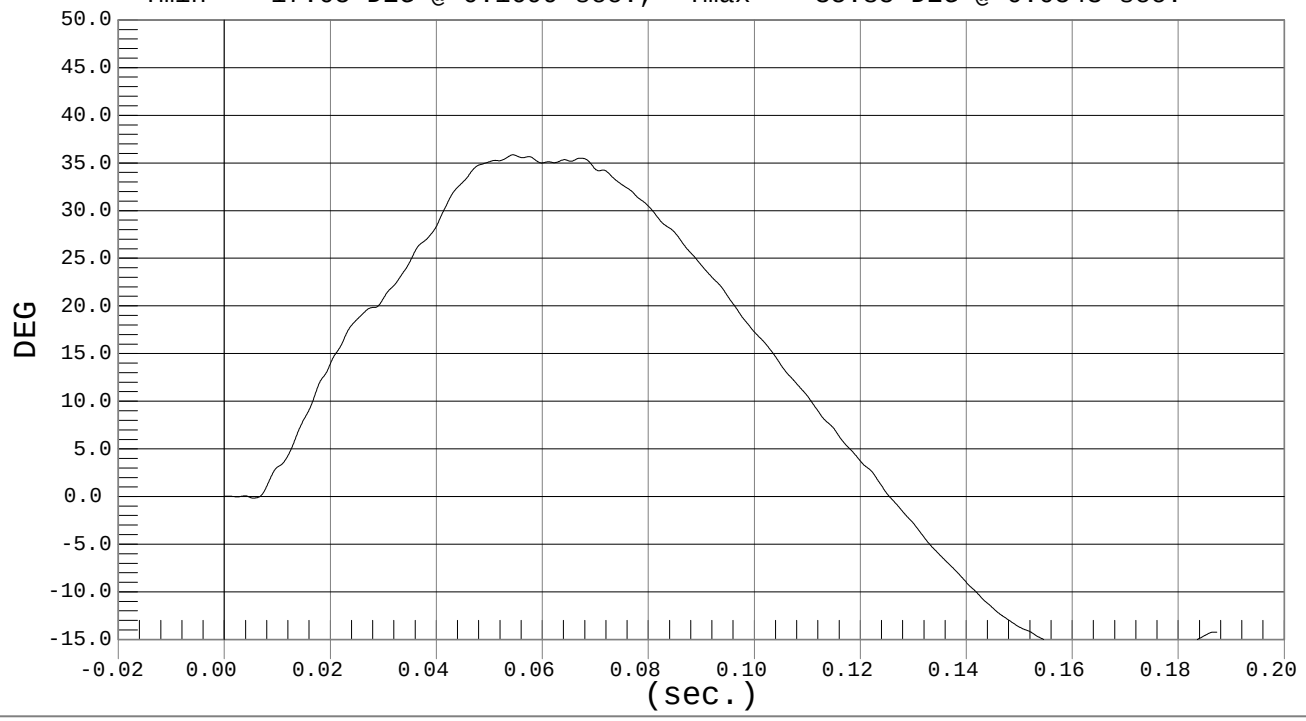


THETA A

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 03-04-03
Speed: 11.0 fps, 3.34 M/s

Ymin = -17.05 DEG @ 0.1699 sec., Ymax = 35.85 DEG @ 0.0543 sec.

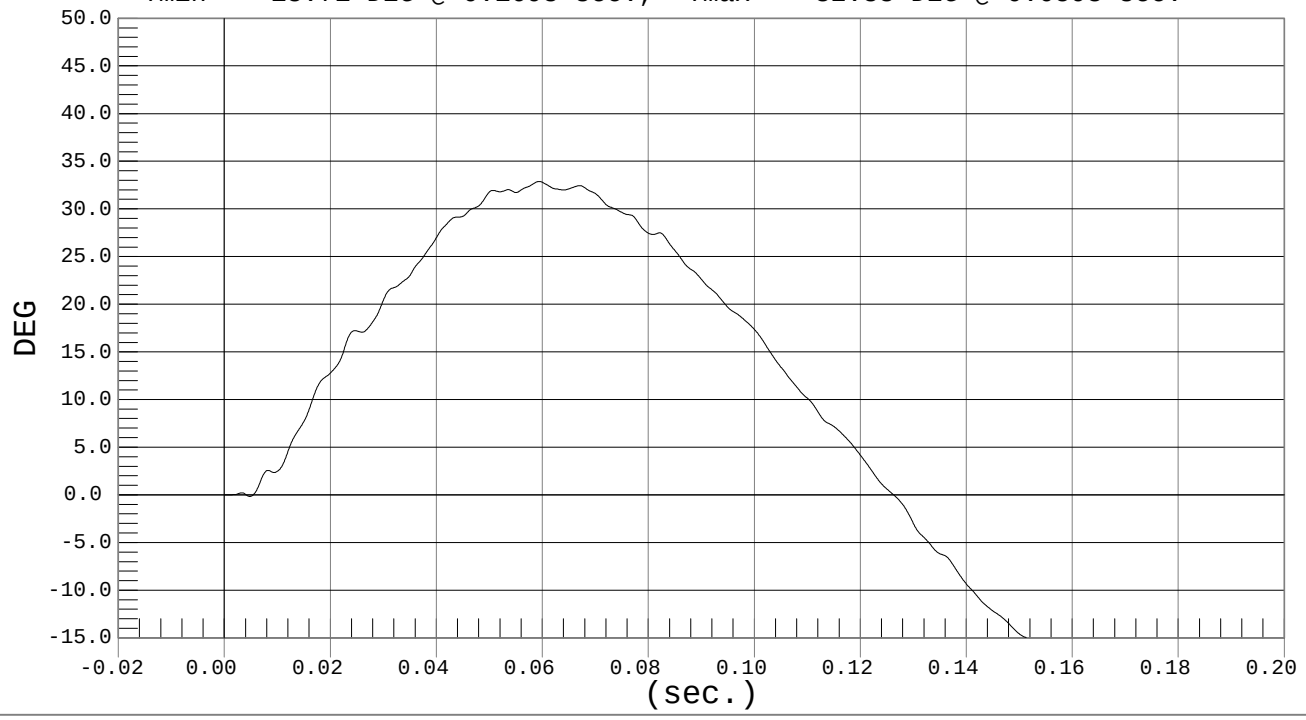


THETA B

Test Desc.: Neck Bending
Component: Dummy #009

Test Date: 03-04-03
Speed: 11.0 fps, 3.34 M/s

Ymin = -18.71 DEG @ 0.1698 sec., Ymax = 32.88 DEG @ 0.0593 sec.



MGA RESEARCH CORPORATION

SHOULDER IMPACT TEST

EUROSID 2 DUMMY

Date: 3/3/03

Dummy Serial Number: 009

Test Number: D03243

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.2
Relative Humidity (%)	10 – 70	17
Pendulum Speed	4.2 – 4.4 m/s	4.3
Max. Resultant Acceleration	7.5 – 10.5 g's	9.3
Time of Max. Pendulum Acceleration	msec	11.1

TEST MEETS SPECIFICATIONS

Technician: _____

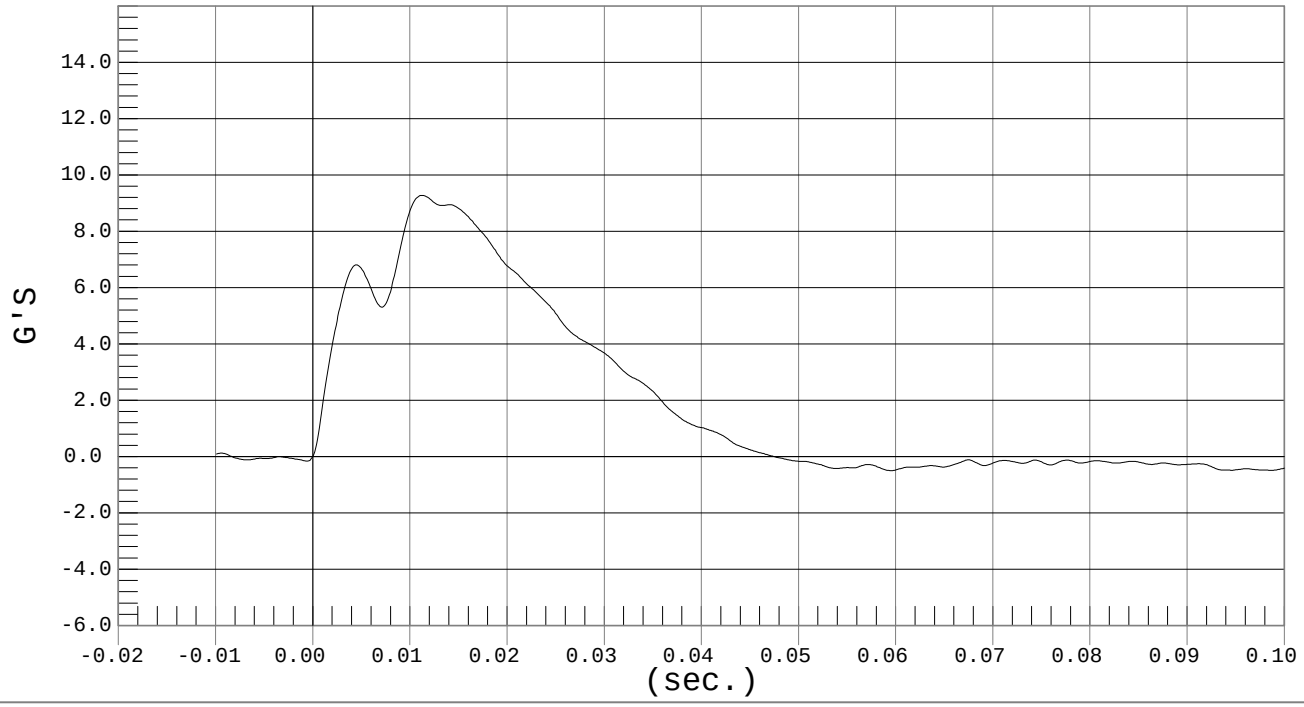
Approved By: _____

SHOULDER ACCELERATION

Test Desc.: Shoulder Impact
Component: Dummy #009

Test Date: 03-03-03
Speed: 14.0 fps, 4.28 M/s

Ymin = -.82 G'S @ 0.1770 sec., Ymax = 9.27 G'S @ 0.0111 sec.



MGA RESEARCH CORPORATION

UPPER/MIDDLE/LOWER RIB TESTS

EUROSID 2 DUMMY

Date: 3/4/03

Dummy Serial Number: 009

Test Number: D03244/5/6

UPPER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.8
Relative Humidity (%)	10 – 70	20
Displacement at 2 m/s	23.5 – 27.5 mm	26.9
Displacement at 3 m/s	36.0 – 40.0 mm	39.2
Displacement at 4 m/s	46.0 – 51.0 mm	50.7

MIDDLE RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	208
Relative Humidity (%)	10 – 70	20
Displacement at 2 m/s	23.5 – 27.5 mm	25.4
Displacement at 3 m/s	36.0 – 40.0 mm	37.1
Displacement at 4 m/s	46.0 – 51.0 mm	48.7

LOWER RIB - TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.8
Relative Humidity (%)	10 – 70	20
Displacement at 2 m/s	23.5 – 27.5 mm	26.1
Displacement at 3 m/s	36.0 – 40.0 mm	37.7
Displacement at 4 m/s	46.0 – 51.0 mm	49.0

TEST MEETS SPECIFICATIONS

Technician: _____

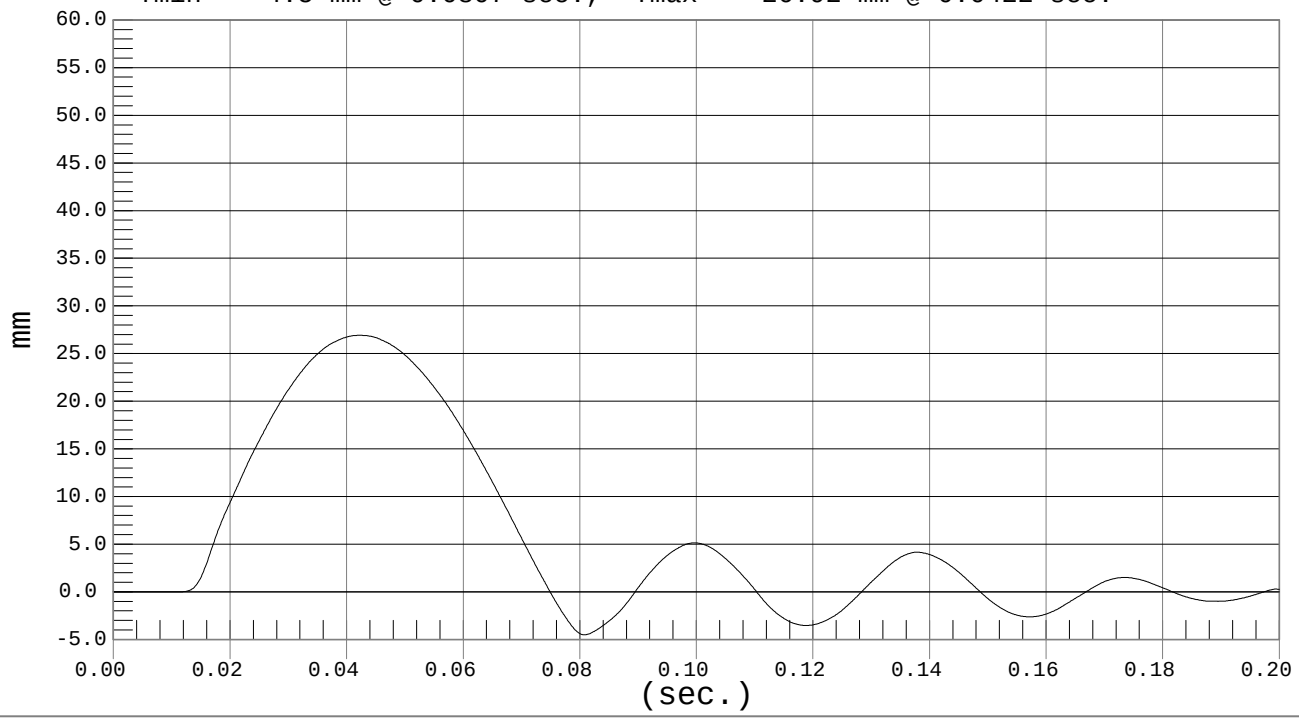
Approved By: _____

UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 03-04-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -4.5 mm @ 0.0807 sec., Ymax = 26.92 mm @ 0.0422 sec.

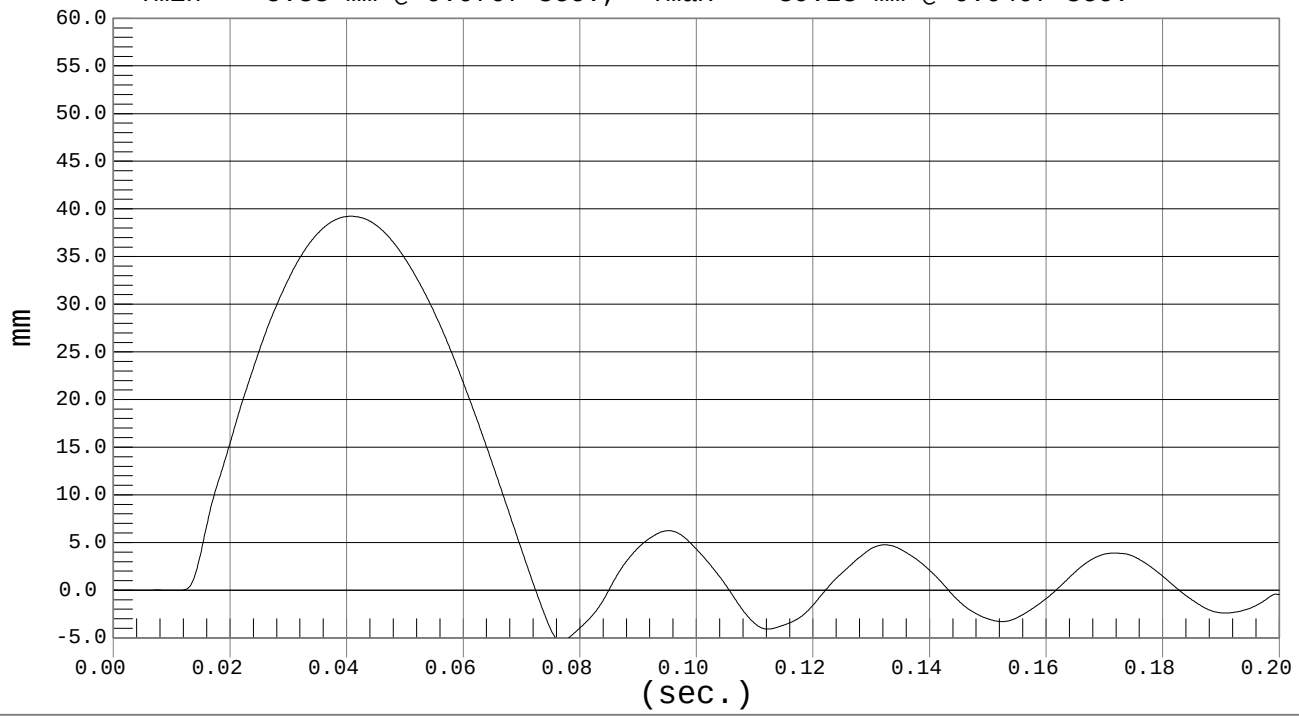


UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 03-04-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -5.33 mm @ 0.0767 sec., Ymax = 39.23 mm @ 0.0407 sec.

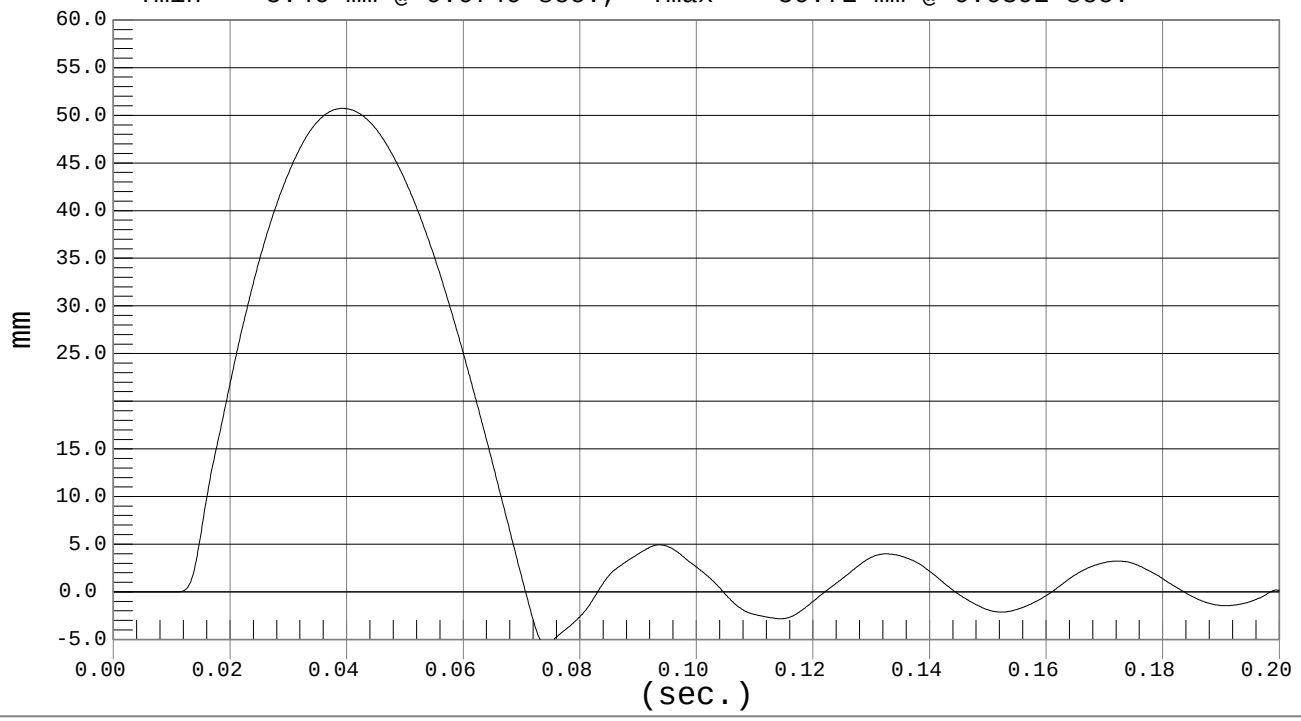


UPPER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 03-04-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -5.46 mm @ 0.0740 sec., Ymax = 50.72 mm @ 0.0392 sec.

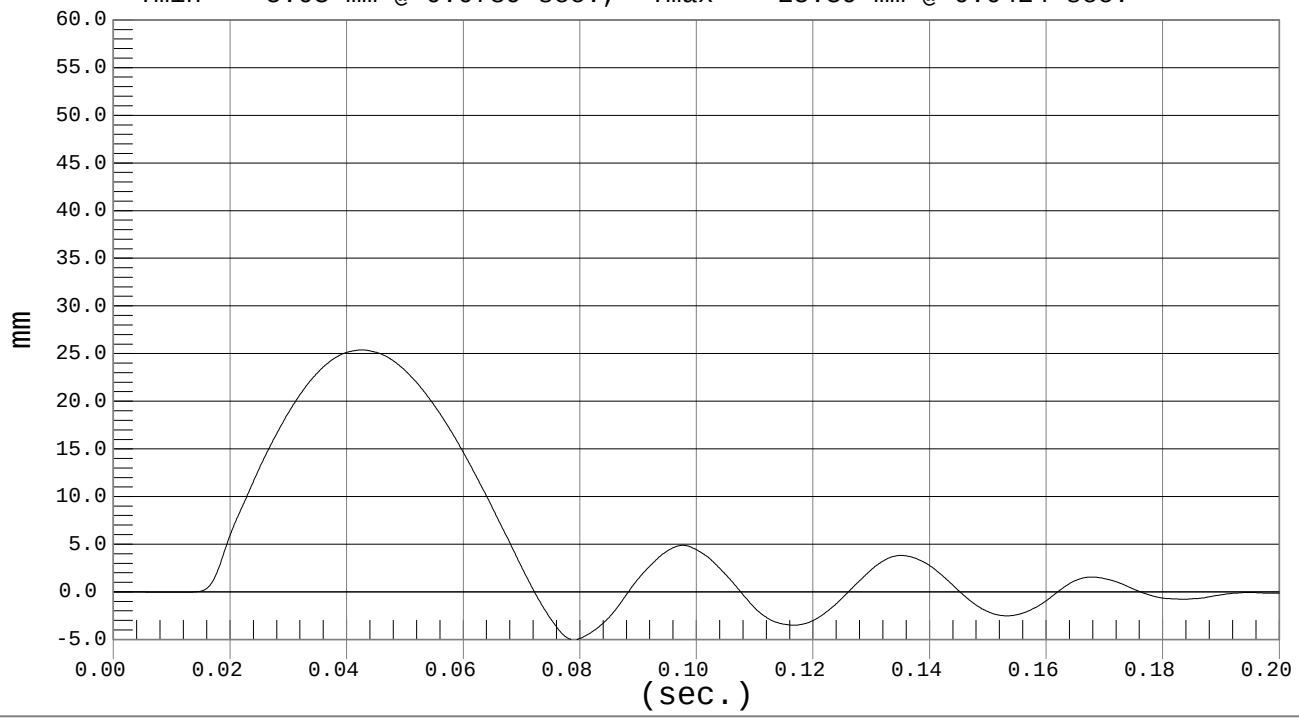


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 03-04-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.03 mm @ 0.0789 sec., Ymax = 25.39 mm @ 0.0424 sec.

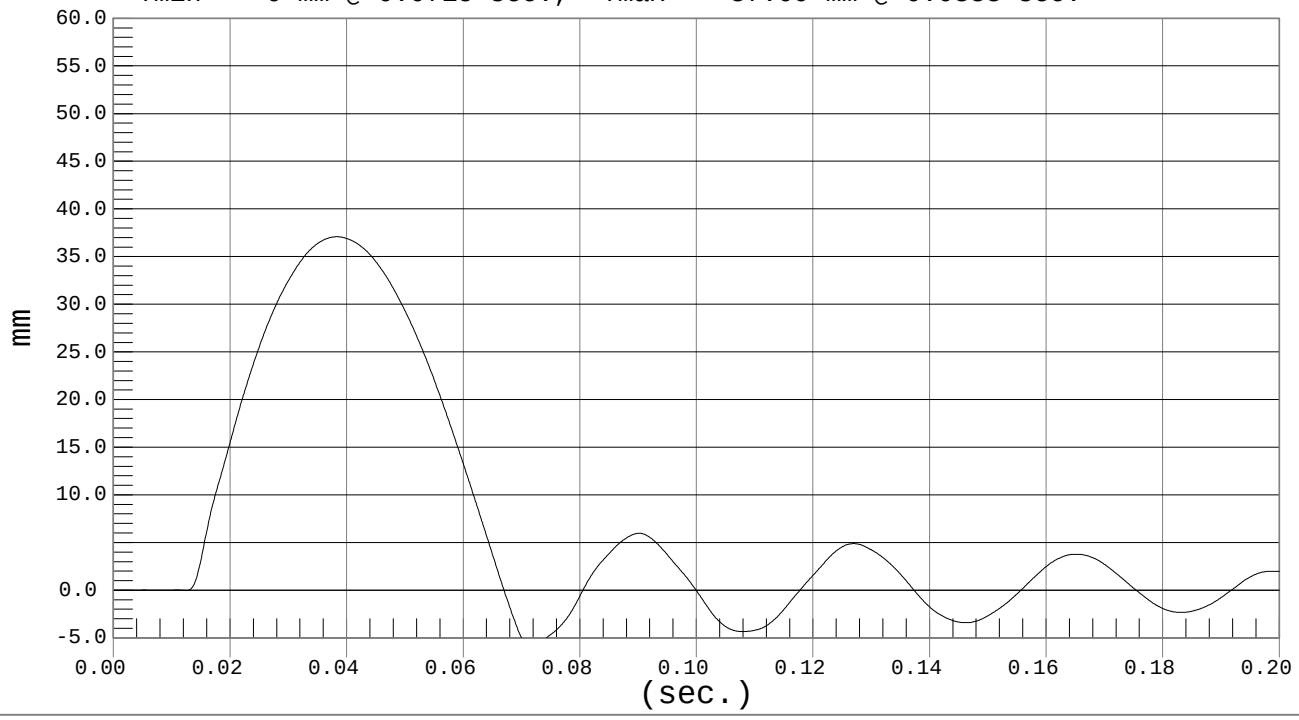


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 03-04-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -6 mm @ 0.0715 sec., Ymax = 37.09 mm @ 0.0383 sec.

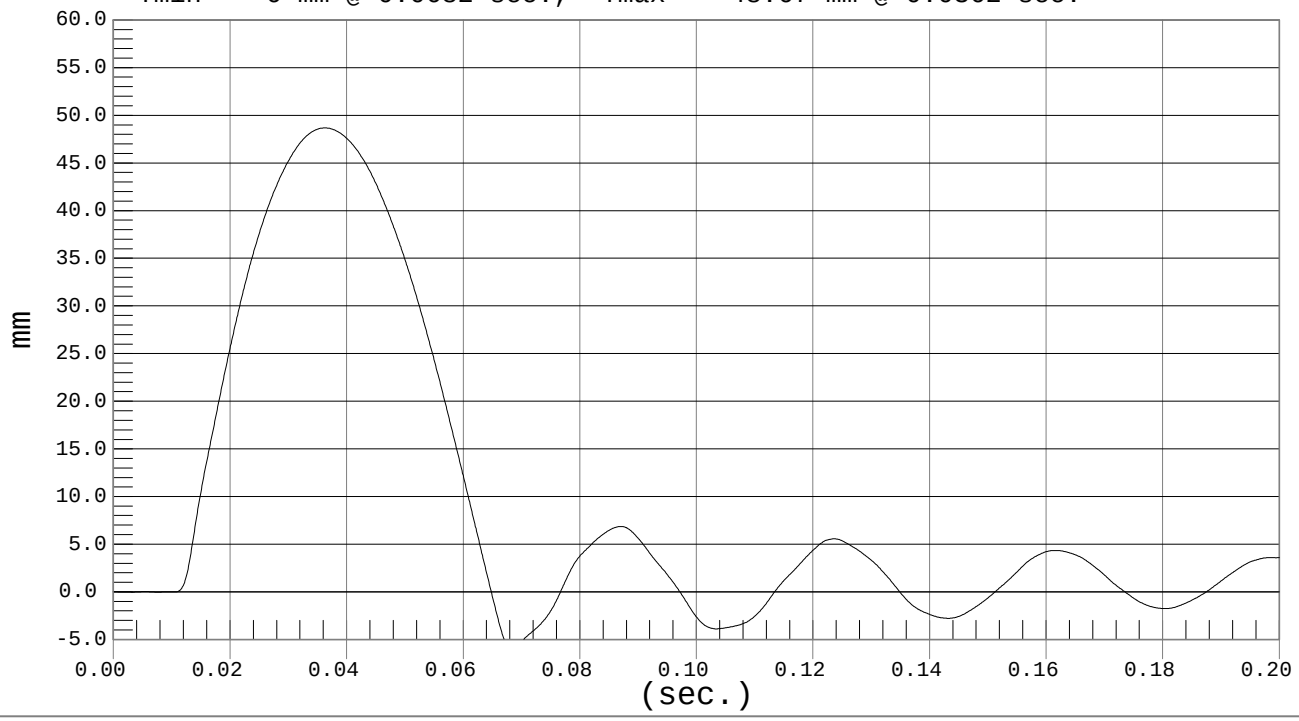


MIDDLE RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 03-04-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -6 mm @ 0.0682 sec., Ymax = 48.67 mm @ 0.0362 sec.

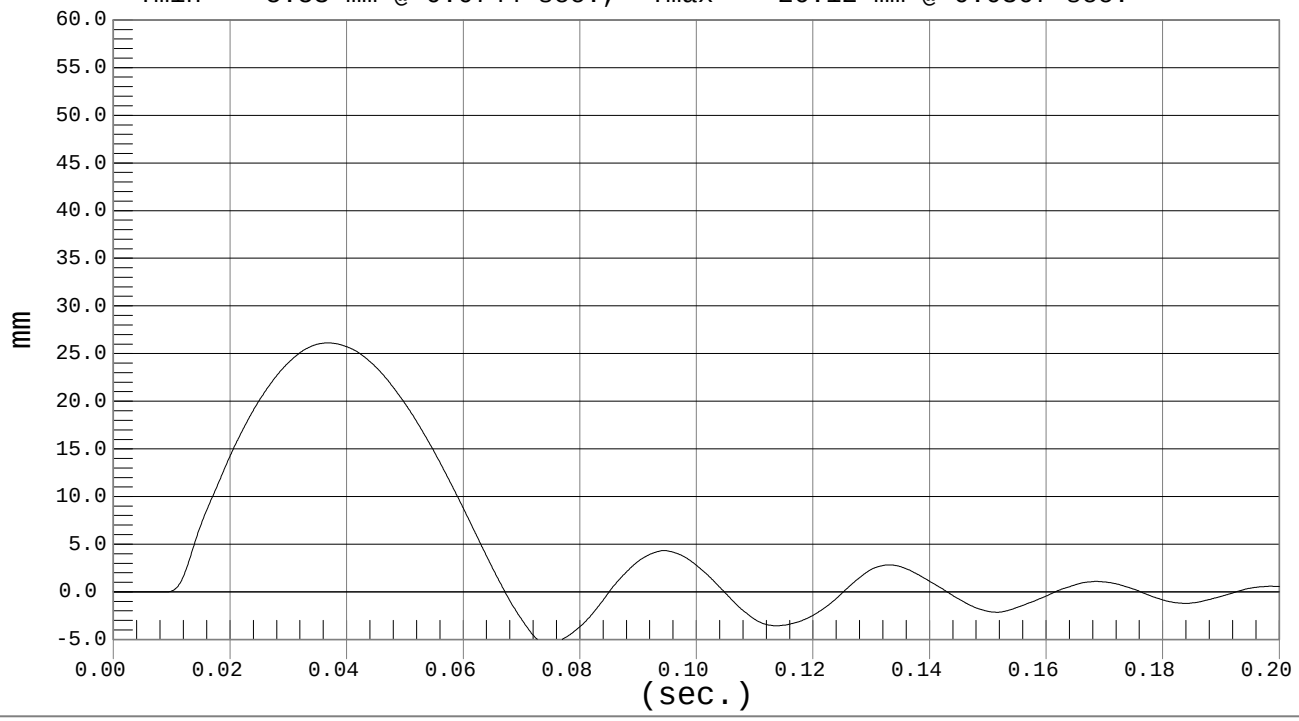


LOWER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 03-04-03
Speed: 6.6 fps, 2.00 M/s

Ymin = -5.53 mm @ 0.0744 sec., Ymax = 26.12 mm @ 0.0367 sec.

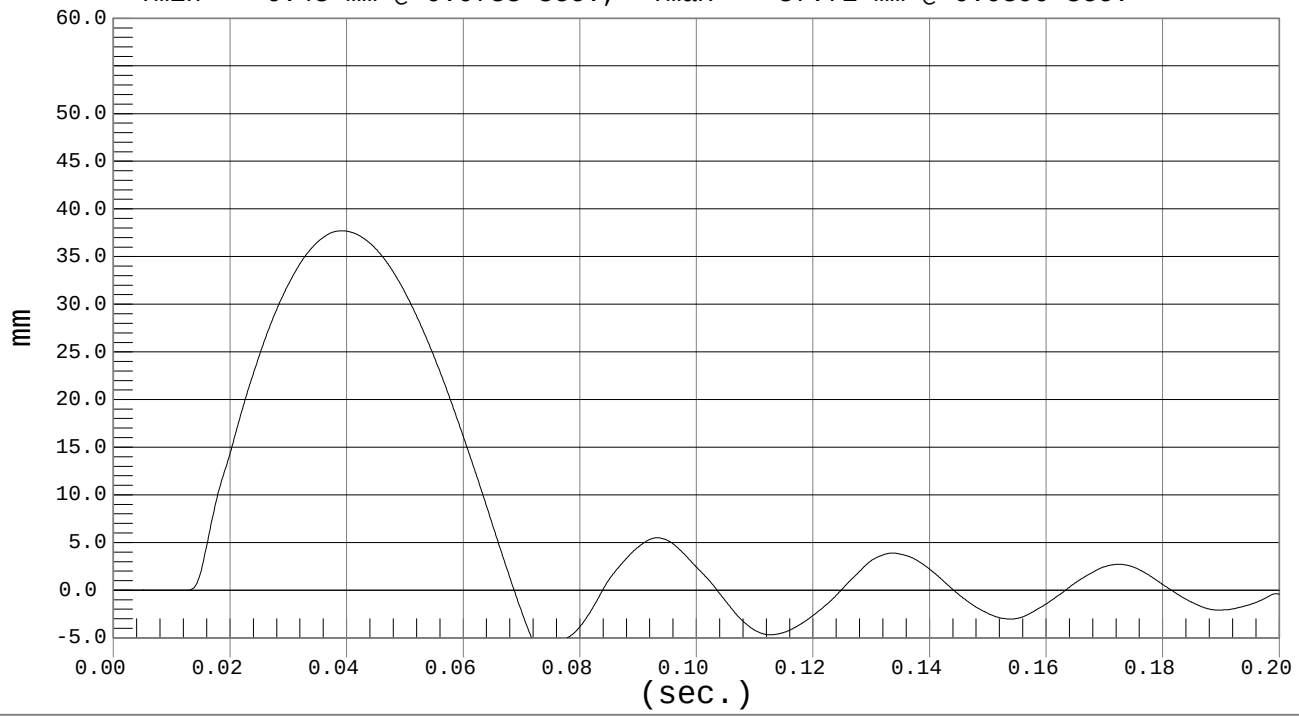


LOWER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 03-04-03
Speed: 9.8 fps, 3.00 M/s

Ymin = -6.48 mm @ 0.0738 sec., Ymax = 37.71 mm @ 0.0390 sec.

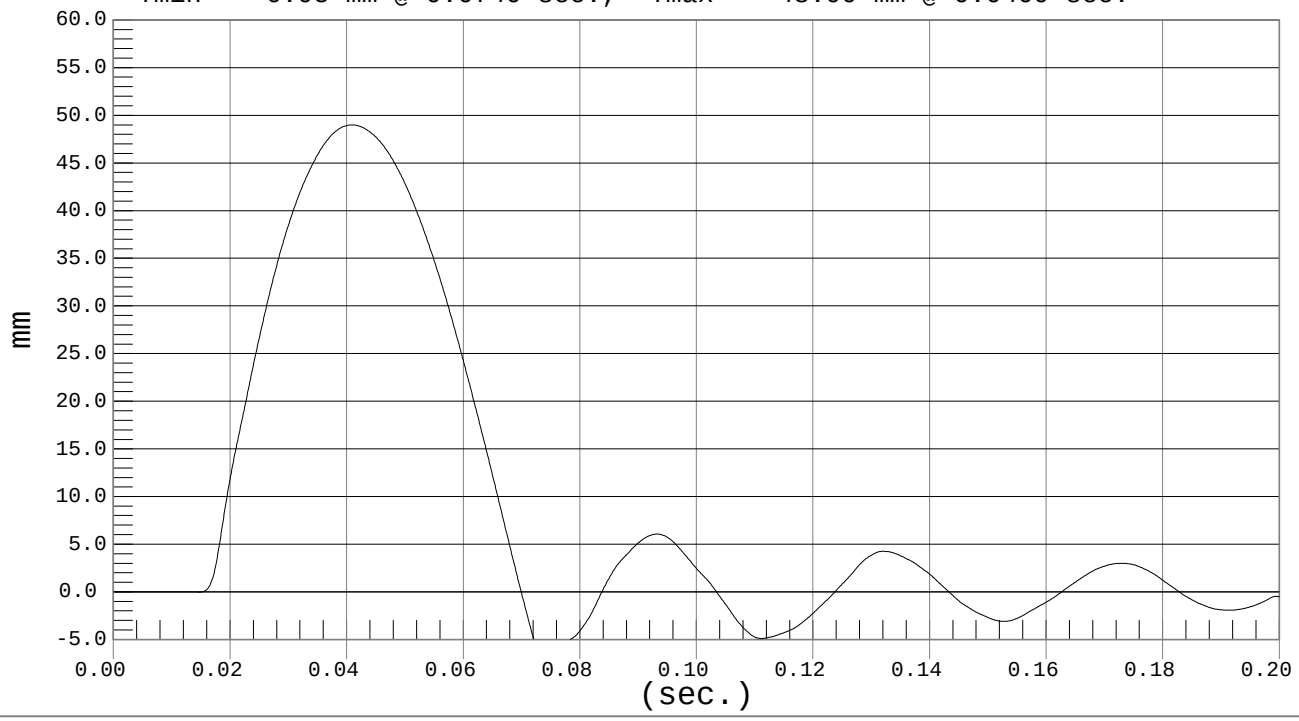


LOWER RIB DISPLACEMENT

Test Desc.: Rib Module
Component: Dummy #009

Test Date: 03-04-03
Speed: 13.1 fps, 4.00 M/s

Ymin = -6.95 mm @ 0.0740 sec., Ymax = 48.99 mm @ 0.0409 sec.



MGA RESEARCH CORPORATION

ABDOMEN TEST

EUROSID 2 DUMMY

Date: 3/4/03

Dummy Serial Number: 009

Test Number: D03247

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.8
Relative Humidity (%)	10 – 70	21
Probe Speed (m/s)	3.90 – 4.10	4.10
Maximum Impact Force	4.00 – 4.80 kN	4.57
Time of Maximum Force	10.60 – 13.00 ms	10.90
Maximum Total Abdomen Force	2.20 – 2.70 kN	2.46
Time of Max. Total Force	10.00 – 12.30 ms	10.50

TEST MEETS SPECIFICATIONS

Technician: _____

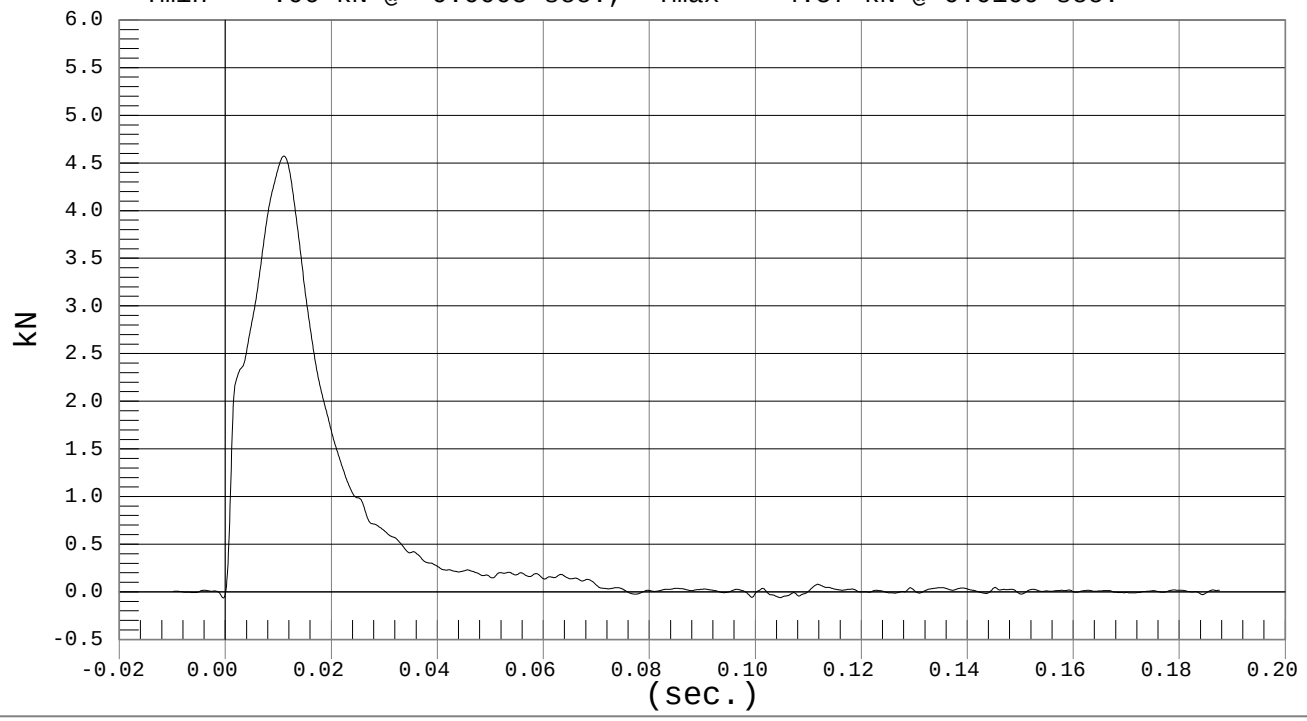
Approved By: _____

IMPACTOR FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 03-04-03
Speed: 13.4 fps, 4.10 M/s

Ymin = -.06 kN @ -0.0005 sec., Ymax = 4.57 kN @ 0.0109 sec.

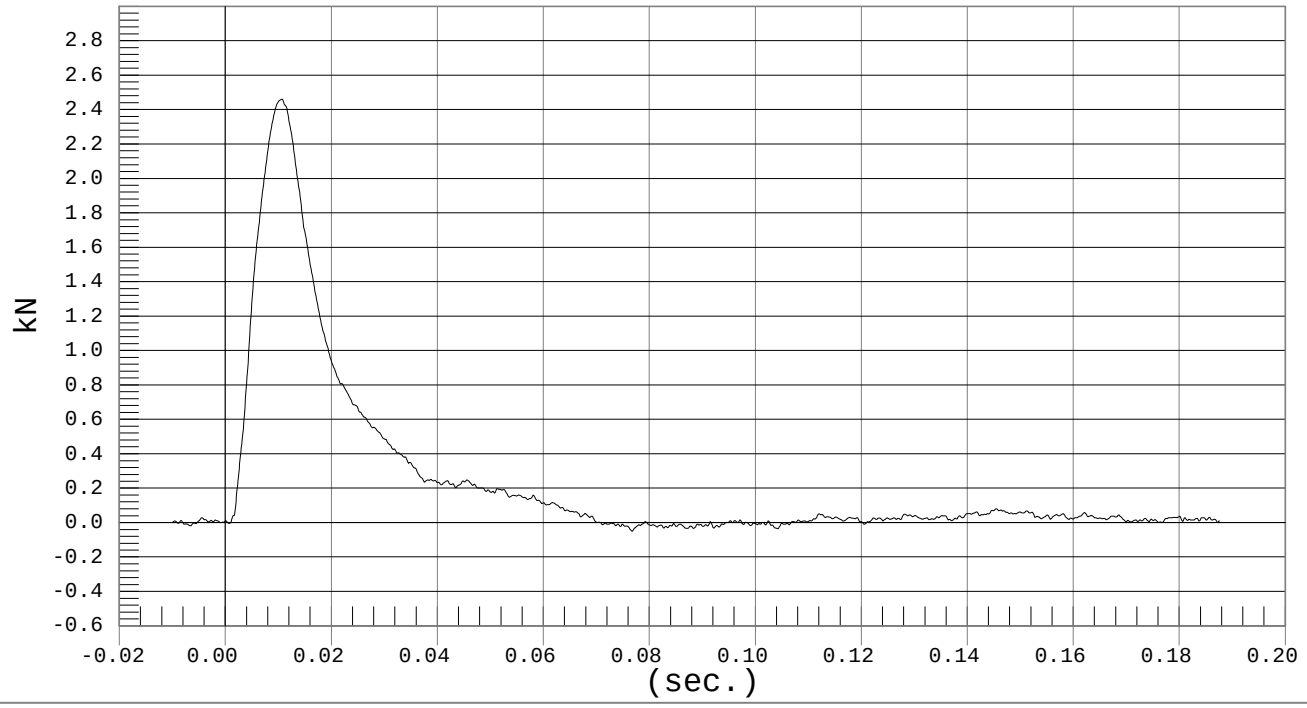


ABDOMEN FORCE

Test Desc.: Abdomen Impact
Component: Dummy #009

Test Date: 03-04-03
Speed: 13.4 fps, 4.10 M/s

Ymin = -.05 kN @ 0.0767 sec., Ymax = 2.46 kN @ 0.0105 sec.



MGA RESEARCH CORPORATION

LUMBAR SPINE TEST

EUROSID 2 DUMMY

Date: 3/4/03

Dummy Serial Number: 009

Test Number: D03248

TEST PARAMETER		SPECIFICATION	TEST RESULTS
Temperature (°C)		18.0 – 22.0	20.7
Relative Humidity (%)		10 – 70	21
Pendulum Speed		5.95 – 6.15	6.05
Pendulum Deceleration	10 msec	-2.46 - -1.59 m/sec	-1.84
	20 msec	-5.25 - -4.07 m/sec	-4.25
	25 msec	-6.64 - -5.30 m/sec	-5.33
	30 msec	≥ -6.5 m/sec	-6.17
Maximum Flexion Angle		45.0 – 55.0 deg	54.1
Time of Max. Flexion Angle		39.0 – 53.0 ms	46.1
Maximum Angle Theta (A)		31.0 – 35.0 deg	34.1
Time of Max. Theta (A)		44.0 – 52.0 ms	46.3
Maximum Angle Theta (B)		29.28– 31.78 deg	29.80
Time of Max. Theta (B)		44.0 – 52.0 ms	48.70

TEST MEETS SPECIFICATIONS

Technician: _____

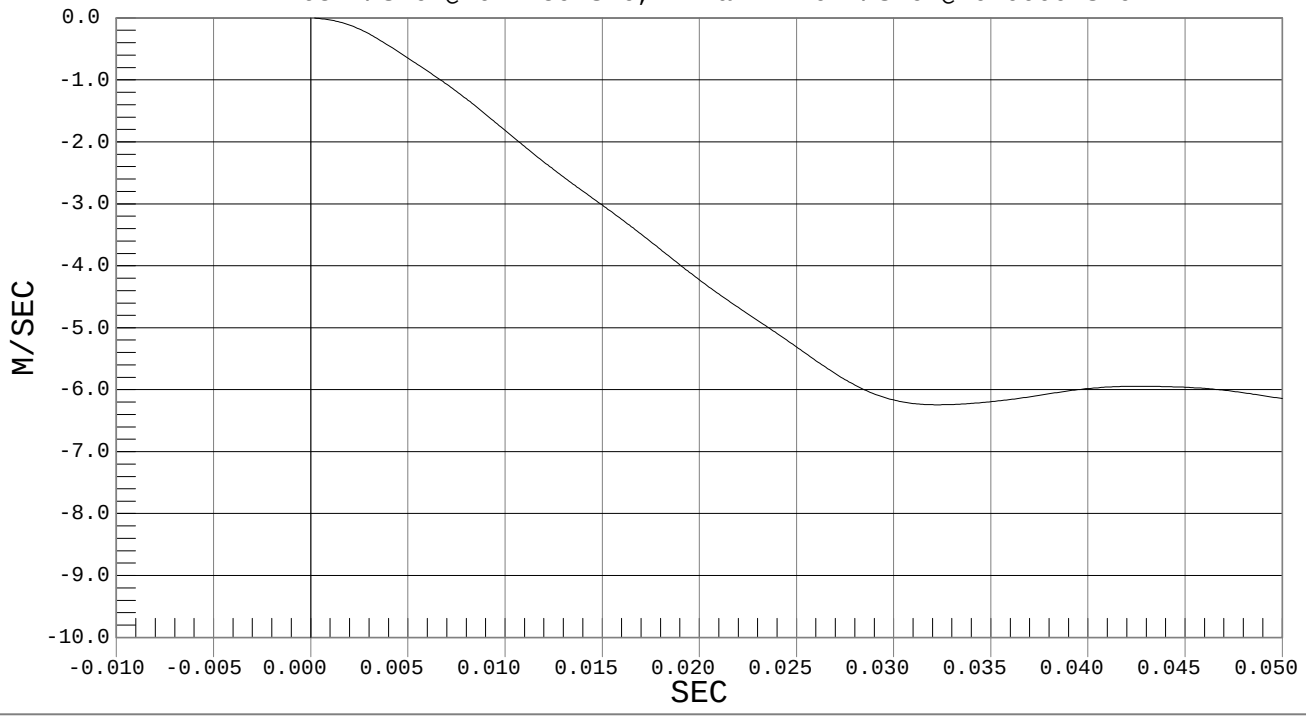
Approved By: _____

PENDULUM DECELERATION

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 03-04-03
Speed: 19.9 fps, 6.05 M/s

Ymin = -7.63 M/SEC @ 0.1459 SEC, Ymax = 0 M/SEC @ 0.0000 SEC

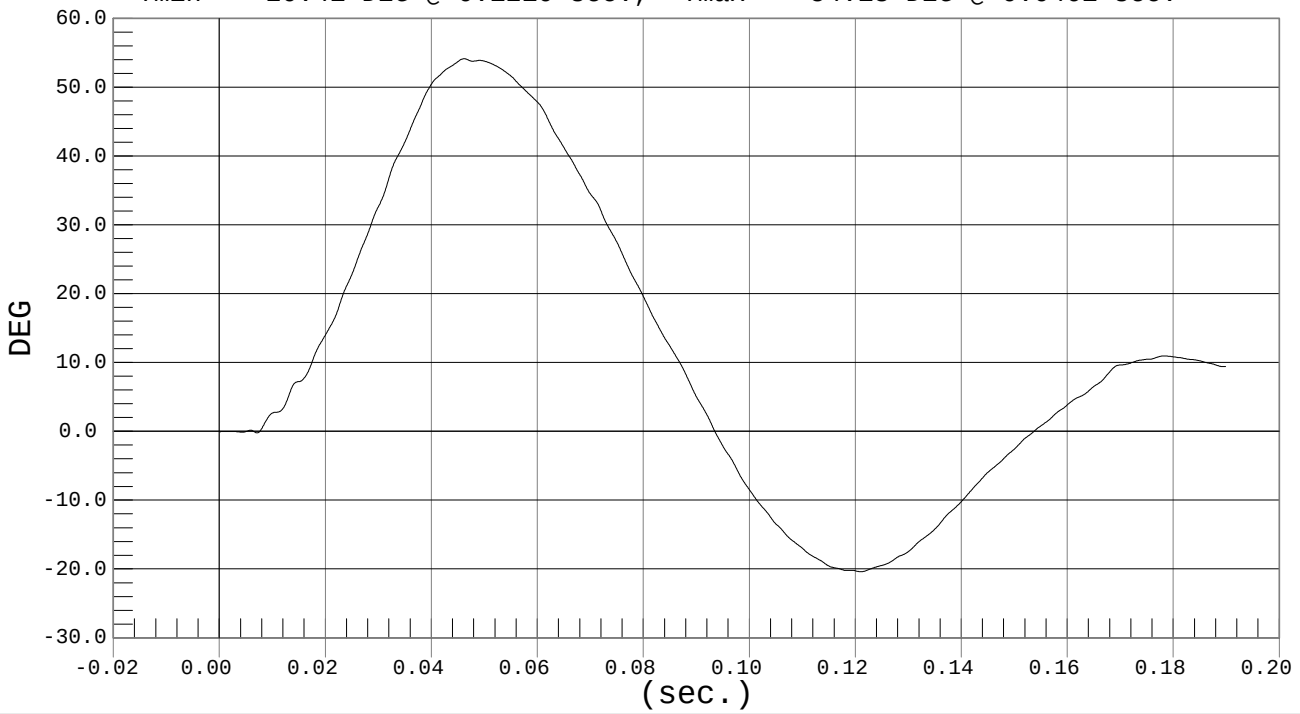


FLEXION ANGLE

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 03-04-03
Speed: 19.9 fps, 6.05 M/s

Ymin = -20.41 DEG @ 0.1210 sec., Ymax = 54.13 DEG @ 0.0461 sec.

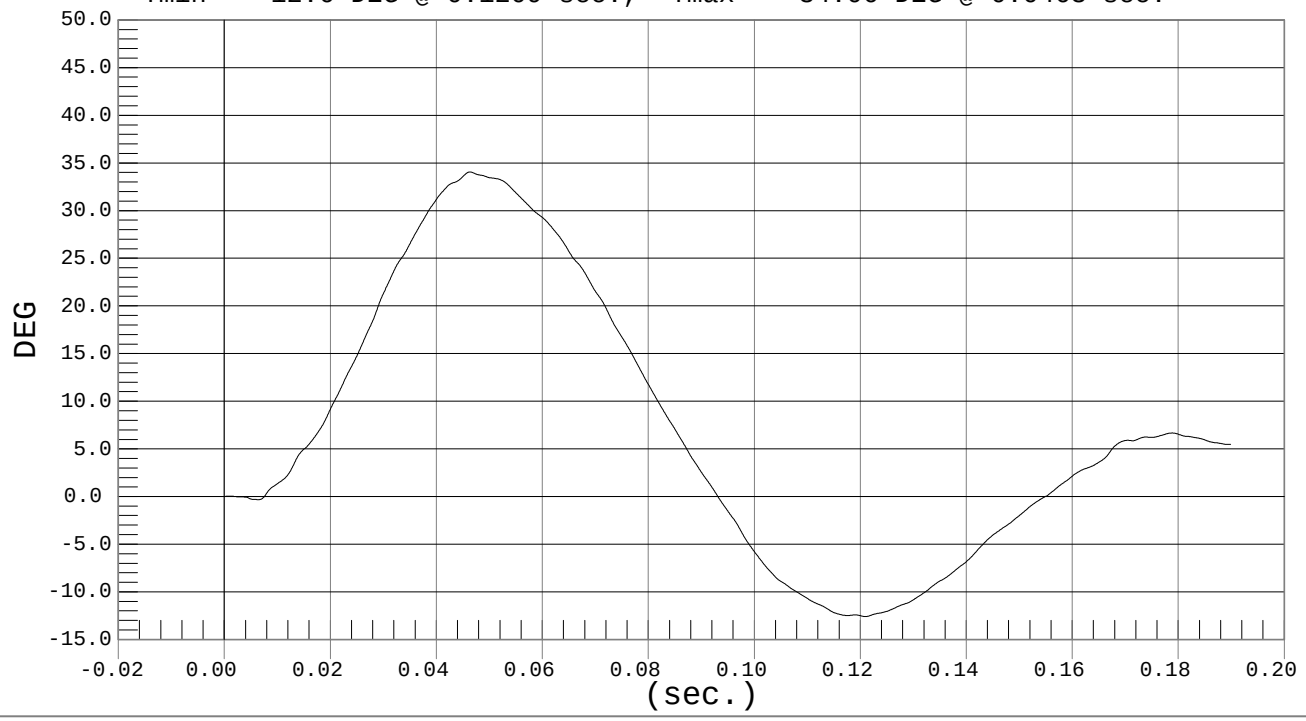


THETA A

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 03-04-03
Speed: 19.9 fps, 6.05 M/s

Ymin = -12.6 DEG @ 0.1209 sec., Ymax = 34.06 DEG @ 0.0463 sec.

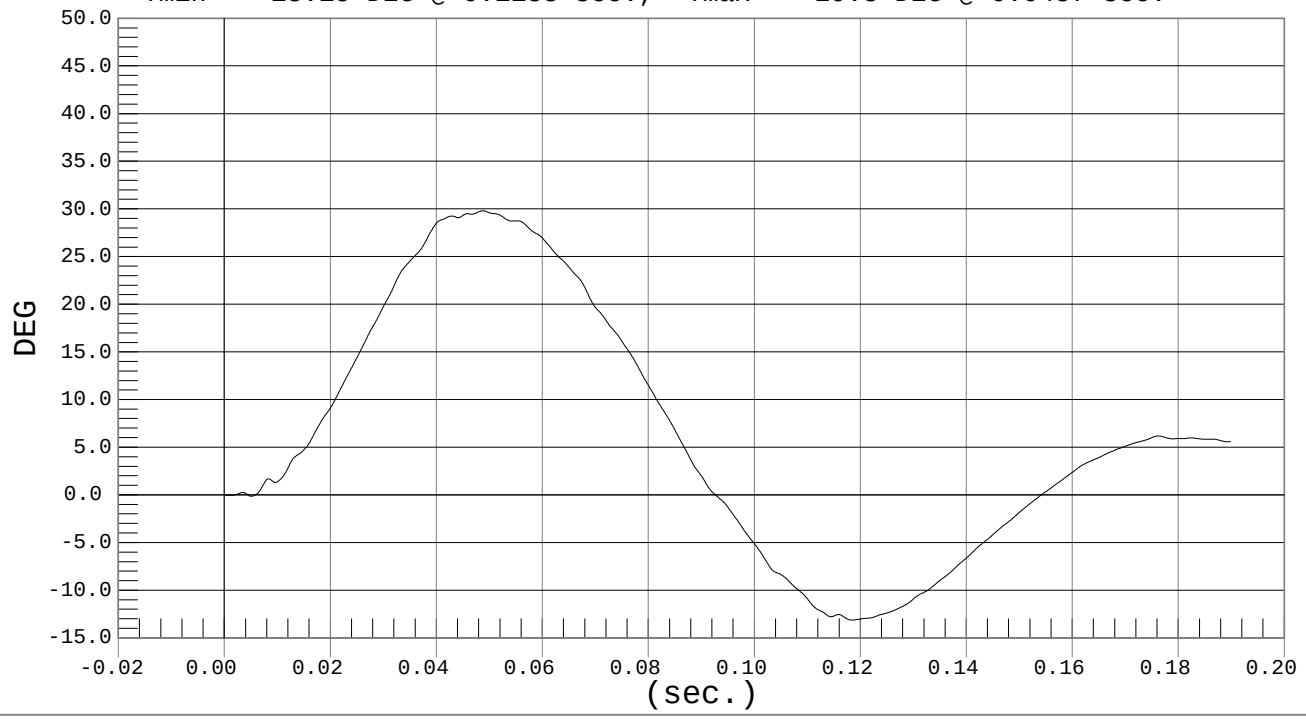


THETA B

Test Desc.: Lumbar Flexion
Component: Dummy #009

Test Date: 03-04-03
Speed: 19.9 fps, 6.05 M/s

Ymin = -13.15 DEG @ 0.1183 sec., Ymax = 29.8 DEG @ 0.0487 sec.



MGA RESEARCH CORPORATION

PELVIS TEST

EUROSID 2 DUMMY

Date: 3/3/03

Dummy Serial Number: 009

Test Number: D03249

TEST PARAMETER	SPECIFICATION	TEST RESULTS
Temperature (°C)	18.0 – 22.0	20.3
Relative Humidity (%)	10 – 70	16
Pendulum Speed	4.20 – 4.40 m/s	4.28
Maximum Impactor Force	4.40 – 5.40 kN	4.72
Time of Max. Impactor Force	10.30 – 15.50 ms	14.60
Maximum Pubic Force	1.04 – 1.64 kN	1.34
Time of Max. Pubic Force	9.90 – 15.90 ms	13.50

TEST MEETS SPECIFICATIONS

Technician: _____

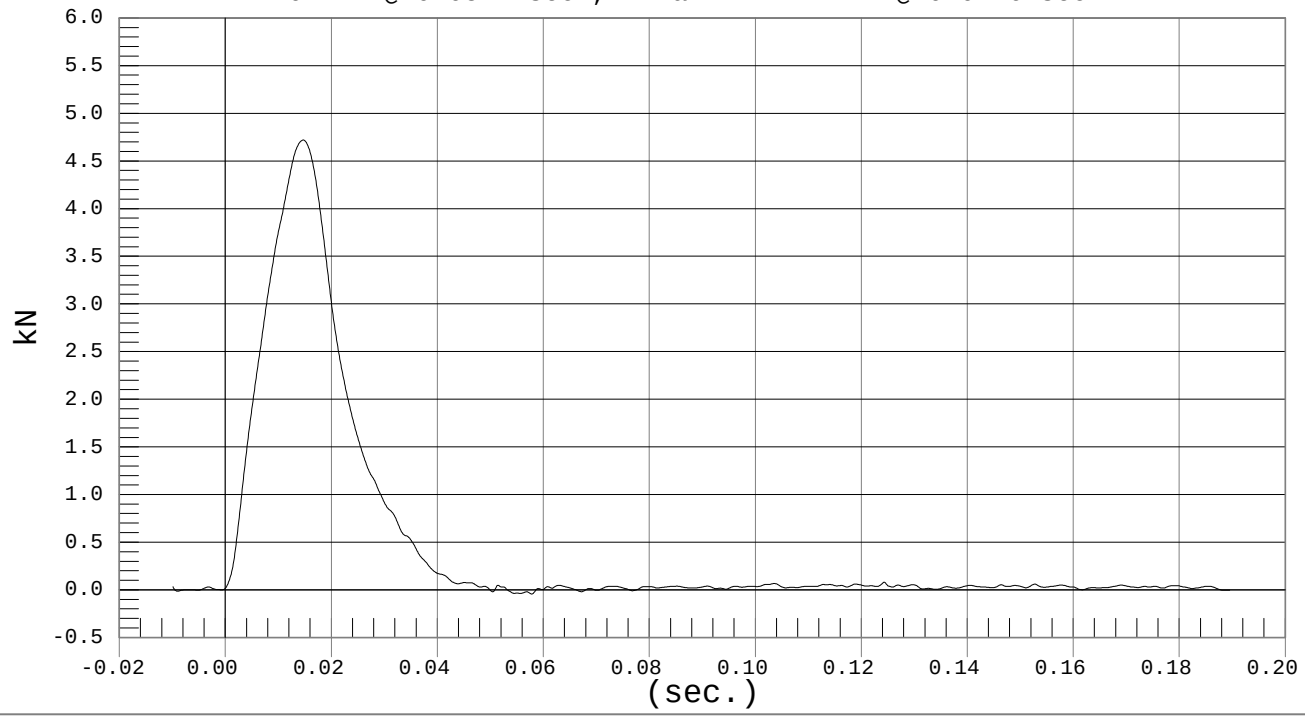
Approved By: _____

IMPACTOR FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 03-03-03
Speed: 14.1 fps, 4.28 M/s

Ymin = -.04 kN @ 0.0577 sec., Ymax = 4.72 kN @ 0.0146 sec.

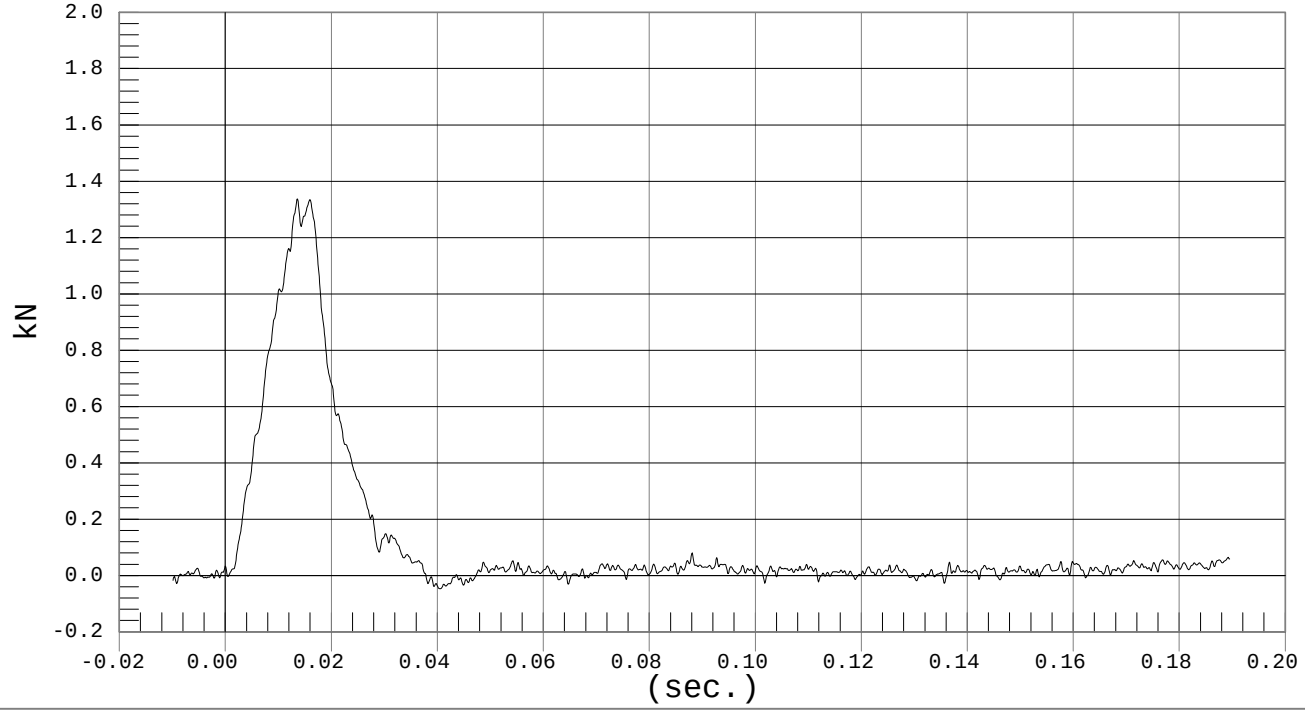


PUBIC FORCE

Test Desc.: Pelvis Impact
Component: Dummy #009

Test Date: 03-03-03
Speed: 14.1 fps, 4.28 M/s

Ymin = -.05 kN @ 0.0404 sec., Ymax = 1.34 kN @ 0.0135 sec.



APPENDIX D
TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

DUMMY AND VEHICLE CALIBRATION DATA

	INSTRUMENTS FOR LEFT FRONT DUMMY NO. 009		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Head X Accelerometer	AHRP5	Endevco	9/6/02
Head Y Accelerometer	ALB87	Endevco	9/6/02
Head Z Accelerometer	AJ9T6	Endevco	9/6/02
Driver Head Y – Front	ALEC1	Endevco	9/9/02
Driver Head Z – Front	J14896	Endevco	1/8/03
Driver Head X – Left	AJ9D9	Endevco	9/6/02
Driver Head Z – Left	AGM47	Endevco	9/6/02
Driver Head X – Upper	ANAN3	Endevco	10/16/02
Driver Head Y – Upper	ANAN6	Endevco	10/16/02
Upper Neck Force X Load Cell	N105FX	FTSS	5/13/02
Upper Neck Force Y Load Cell	N105FY	FTSS	5/13/02
Upper Neck Force Z Load Cell	N105FZ	FTSS	5/13/02
Upper Neck Moment X	N105MX	FTSS	5/13/02
Upper Neck Moment Y	N105MY	FTSS	5/13/02
Upper Neck Moment Z	N105MZ	FTSS	5/13/02
Lower Neck Force X Load Cell	N110FX	FTSS	5/16/02
Lower Neck Force Y Load Cell	N110FY	FTSS	5/16/02
Lower Neck Force Z Load Cell	N110FZ	FTSS	5/16/02
Lower Neck Moment X	N110MX	FTSS	5/16/02
Lower Neck Moment Y	N110MY	FTSS	5/16/02
Lower Neck Moment Z	N110MZ	FTSS	5/16/02
Shoulder Force X Load Cell	S119FX	FTSS	5/10/02
Shoulder Force Y Load Cell	S119FY	FTSS	5/10/02
Shoulder Force Z Load Cell	S119FZ	FTSS	5/10/02
Upper Spine X Accelerometer	AJ9D8	Endevco	1/8/03
Upper Spine Y Accelerometer	AJ9D6	Endevco	1/8/03
Upper Spine Z Accelerometer	J13772	Endevco	1/15/03
Upper Rib Y Accelerometer	ANAP1	Endevco	9/9/02
Mid Rib Y Accelerometer	AMP12	Endevco	9/9/02
Lower Rib Y Accelerometer	AGWA4	Endevco	9/9/02
Upper Rib Displacement	009U	Honeywell	5/22/01
Mid Rib Displacement	009M	Honeywell	5/22/01
Lower Rib Displacement	009L	Honeywell	5/22/01
Lower Spine X Accelerometer	AKAA6	Endevco	9/9/02
Lower Spine Y Accelerometer	ALBA7	Endevco	9/9/02
Lower Spine Z Accelerometer	AP2C4	Endevco	9/9/02
Torso Force X Load Cell	ET102FX	FTSS	12/6/02
Torso Force Y Load Cell	ET102FY	FTSS	12/6/02
Torso Moment Y Load Cell	ET102MY	FTSS	12/6/02
Torso Moment Z Load Cell	ET102MZ	FTSS	12/6/02
T-12 Force X Load Cell	LS103FX	FTSS	5/13/02

	INSTRUMENTS FOR LEFT FRONT DUMMY NO. 009		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
T-12 Force Y Load Cell	LS103FY	FTSS	5/13/02
T-12 Moment X Load Cell	LS103MX	FTSS	5/13/02
T-12 Moment Y Load Cell	LS103MY	FTSS	5/13/02
Front Abdomen Load Cell	A122FY	FTSS	5/16/02
Mid Abdomen Load Cell	A123FY	FTSS	5/16/02
Rear Abdomen Load Cell	A124FY	FTSS	5/16/02
Pelvis X Accelerometer	J13650	Endevco	9/9/02
Pelvis Y Accelerometer	J13424	Endevco	9/9/02
Pelvis Z Accelerometer	J14007	Endevco	9/9/02
Right Femur Force X Load Cell	F135FX	FTSS	5/13/02
Right Femur Force Y Load Cell	F135FY	FTSS	5/13/02
Right Femur Force Z Load Cell	F135FZ	FTSS	5/13/02
Right Femur Moment X	F135MX	FTSS	5/13/02
Right Femur Moment Y	F135MY	FTSS	5/13/02
Right Femur Moment Z	F135MZ	FTSS	5/13/02
Left Femur Force X Load Cell	F136FX	FTSS	5/13/02
Left Femur Force Y Load Cell	F136FY	FTSS	5/13/02
Left Femur Force Z Load Cell	F136FZ	FTSS	5/13/02
Left Femur Moment X	F136MX	FTSS	5/13/02
Left Femur Moment Y	F136MY	FTSS	5/13/02
Left Femur Moment Z	F138MZ	FTSS	6/3/02
Lumbar Force Y Load Cell	L104FY	FTSS	5/10/02
Lumbar Force Z Load Cell	L104FZ	FTSS	8/15/02
Lumbar Moment X Load Cell	L104MX	FTSS	8/15/02
Pubic Symphysis Force Y	P115FY	FTSS	5/13/02

VEHICLE INSTRUMENT CALIBRATION

	VEHICLE ACCELEROMETERS		
	SERIAL NO.	MANUFACTURER	CALIBRATION DATE
Left Upper A-Post Roof Y	99F341	ENTRAN	1/30/03
Left Mid A-Post Y	99F159	ENTRAN	9/13/02
Left Lower A-Post Y	I25-F15	ENTRAN	1/16/03
Left Mid B-Post Y	G03-N02	ENTRAN	9/6/02
Left Lower B-Post Y	G03-N12	ENTRAN	10/7/02
Left Upper B-Post Y	G03-N08	ENTRAN	9/6/02
Floorpan @ Rear Axle X	K16-X08	ENTRAN	11/19/02
Floorpan @ Rear Axle Y	H01-N18	ENTRAN	10/30/02
Floorpan @ Rear Axle Z	C25-A25	ENTRAN	9/6/02
Driver Seat Track Y	L23-A09	ENTRAN	1/30/03
Right Front Sill X	G03-N06	ENTRAN	1/16/03
Right Front Sill Y	K21-N18	ENTRAN	1/16/03
Right Front Sill Z	G01-N01	ENTRAN	1/16/03
Right Rear Sill X	H01-N26	ENTRAN	11/19/02
Right Rear Sill Y	E03-H06	ENTRAN	11/19/02
Right Rear Sill Z	99F216	ENTRAN	10/31/02
Left Front Sill Y	G01-N14	ENTRAN	7/24/02
Left Rear Sill Y	H01-N33	ENTRAN	11/19/02
Vehicle CG X	H01-N23	ENTRAN	11/19/02
Vehicle CG Y	H01-N32	ENTRAN	11/19/02
Vehicle CG Z	H05-F14	ENTRAN	11/19/02
Lower Center Radiator Support X	F07-A14	ENTRAN	9/6/02
Lower Center Radiator Support Y	G03-N11	ENTRAN	9/6/02
Lower Center Radiator Support Z	E03-H24	ENTRAN	9/6/02

Note: All Endevco accelerometers are Model No. 7264-2000
All Entran accelerometers are Model No. EGE-72

APPENDIX E
DUMMY PEAK RESPONSES

DRIVER PEAK RESPONSE TABLE

Location				Peak Values									
				1999 Saab 10/23/01 ES-2		2000 Saab 9/19/02 ES-2		2000 Saab 10/24/02 SID HIII		2000 Saab 1/29/03 214 seating SID H3		2000 Saab 2/26/03 214 seating ES-2	
	Class	Axis	Units	Peak	Time	Peak	Time	Peak	Time	Peak	Time	Peak	Time
Head	1000	X	G	-8.2	63	-60.8	64	-235.2	61	-14.8	60.2	-12.1	67.8
	1000	Y	G	31.9	58	100.9	64	606.6	61	46.4	55.9	41.5	50.4
	1000	Z	G	13.9	58	25.9	64	115.3	61	27.0	46.5	12.2	55.7
	1000	RES	G	35.0	58	119.6	64	655.7	61	47.6	56.4	42.6	53.7
Head Injury Criteria (HIC)				114		243		5155.4		182		171	
t1				42.8		50.8		60.6		45.4		40.8	
t2				69.9		66.2		61.4		68.1		65.0	
Upper Neck Force	1000	X	N	-211	63	-424	63	-729	58	-456	85	-360	77.1
	1000	Y	N	-258	186	-328	167	556	62	-272	176	-315	179.8
	1000	Z	N	476	46	512	96	-3154	61	1290	47	324	152.4
	1000	RES	N	481	46	674	62	3216	61	1300	47	464	177.0
Upper Neck Moment	600	X	Nm	-23.5	173	-28.3	157	-76.3	62	-61.7	53.9	-20.9	162.7
	600	Y	Nm	17.6	104	-41.2	63	-41.1	57	45.7	101.4	30.4	89.5
	600	Z	Nm	18.8	69	27.4	70	21.4	60	28.8	67.5	8.2	69.9
	600	RES	Nm	27.4	175	47.7	63	76.3	62	67.2	54.4	33.3	163.0

DRIVER PEAK RESPONSE TABLE (CONTINUED)

Location				Peak Values									
				1999 Saab 10/23/01 ES-2		2000 Saab 9/19/02 ES-2		2000 Saab 10/24/02 SID HIII		2000 Saab 1/29/03 214 seating SID H3		2000 Saab 2/26/03 214 seating SID H3	
	Class	Axis	Units	Peak	Time	Peak	Time	Peak	Time	Peak	Time	Peak	Time
Lower Neck Force	1000	X	N	-209	60	-679	63					-334	67.3
	1000	Y	N	286	29	-500	53					-340	174.0
	1000	Z	N	438	46	517	55					322	43.8
	1000	RES	N	443	46	789	63					426	151.8
Lower Neck Moment	600	X	Nm	-60.0	189	-67.8	168					-76.9	175.8
	600	Y	Nm	32.2	81	74.1	64					64.6	75.0
	600	Z	Nm	14.7	73	29.4	60					9.9	72.4
	600	RES	Nm	67.7	189	89.2	64					89	175.5
Shoulder Force	600	X	N	381	21	-615	20					-736	21.5
	600	Y	N	1161	21	1295	20					1514	22.2
	600	Z	N	386	22	-379	19					-480	23.8
Upper Spine	180	X	G	7.1	53	-10.7	44	-28.4	52	-14.4	49.7	-14.6	20.0
	180	Y	G	37.7	55	57.6	55	80.8	52	64.9	49.6	58.8	51.5
	180	Z	G	4.7	68	-4.9	53	18.3	62	8.9	45.3		
	180	Res	G	38.4	55	57.8	55	86.6	52	66.5	49.6		

DRIVER PEAK RESPONSE TABLE (CONTINUED)

Location				Peak Values									
				1999 Saab 10/23/01 ES-2		2000 Saab 9/19/02 ES-2		2000 Saab 10/24/02 SID HIII		2000 Saab 1/29/03 214 seating SID H3		2000 Saab 2/26/03 214 seating SID H3	
	Class	Axis	Units	Peak	Time	Peak	Time	Peak	Time	Peak	Time	Peak	Time
Lower Spine	180	X	G	8.1	45	-5.9	86	-25.2	49	-29.2	76.2	7.9	42.8
	180	Y	G	39.7	53	58.3	52	79.8	47	76.1	45.7	48.8	49.2
	180	Z	G	4.3	68	-5.2	92	17.2	62	-12.7	47.3	-3.6	86.3
	180	Res	G	40.2	51	58.3	52	83.7	48	76.5	45.6	49.0	49.2
Upper Rib	180	Y	G	97.9	49	180.9	48	108.9	44	75.9	44.7	130.4	46.4
Mid Rib	180	Y	G	122.5	15	148.8	46					103.4	46.4
Lower Rib	180	Y	G	136.5	14	106.2	48	101.1	45	66.4	42.7	83.6	47.3
Upper Rib Deflection	180	Y	mm	37.8	58	-49.9	59					-49.4	54.2
Mid Rib Deflection	180	Y	mm	29.4	57	-43.0	56					-43.1	53.7
Lower Rib Deflection	180	Y	mm	29.1	56	-33.2	55					-41.8	53.5
Upper Rib VC	180	Y	m/sec	0.50	51	1.3	51					1.0	49.2
Mid Rib VC	180	Y	m/sec	0.31	53	0.9	51					0.7	49.4
Lower Rib VC	180	Y	m/sec	0.29	52	0.5	51					0.5	49.7
Torso Force	600	X	N	534	49	286	58					1072	48.0
	600	Y	N	-225	63	-423	51					-528	57.0
Torso Moment	600	Y	Nm	13.4	47	-7	62					27.8	47.2
	600	Z	Nm	22.4	50	16.9	58					40.2	51.7

DRIVER PEAK RESPONSE TABLE (CONTINUED)

Location				Peak Values									
				1999 Saab 10/23/01 ES-2		2000 Saab 9/19/02 ES-2		2000 Saab 10/24/02 SID HIII		2000 Saab 1/29/03 214 seating SID H3		2000 Saab 2/26/03 214 seating SID H3	
	Class	Axis	Units	Peak	Time	Peak	Time	Peak	Time	Peak	Time	Peak	Time
T12 Force	600	X	N	619	58	893	61					731	79.9
	600	Y	N	1172	50	1975	49					1576	47.4
T12 Moment	600	X	Nm			-124.3	49					-130.8	122.2
	600	Y	Nm	84	58	126.0	68					108	56.4
Abdomen Front Force	600		N	103	71	219	49					188	49.7
Abdomen Mid Force	600		N	255	50	466	48					423	44.8
Abdomen Rear Force	600		N	556	49	702	48					822	44.6
Abdomen Summed Force	600		N	849	50	1382	49					1366	45.8
Pubic Symphysis Force	600		N	1733	55	-2673	47					-1733	46.4
Right Femur Force	600	X	N	352	59	330	89					264	60.1
	600	Y	N	-1207	63	1083	86					856	58.0
	600	Z	N	680	79	1064	100					975	52.6
	600	Res	N	1237	63	1439	86					1249	58.3
Right Femur Moment	600	X	Nm	-105.0	44	-123.8	81					-82.5	41.3
	600	Y	Nm	-28.3	69	-33.8	120					32.3	49.8
	600	Z	Nm	-30.0	56	-33.4	92					-48.0	66.8
	600	Res	Nm	106.9	44	125.4	81					82.9	41.3

DRIVER PEAK RESPONSE TABLE (CONTINUED)

Location				Peak Values									
				1999 Saab 10/23/01 ES-2		2000 Saab 9/19/02 ES-2		2000 Saab 10/24/02 SID HIII		2000 Saab 1/29/03 214 seating SID H3		2000 Saab 2/26/03 214 seating SID H3	
	Class	Axis	Units	Peak	Time	Peak	Time	Peak	Time	Peak	Time	Peak	Time
Left Femur Force	600	X	N	472	73	459	97.9						
	600	Y	N	-795	58	701	82.3					1439	55.8
	600	Z	N	1046	60	1207	81.3					1583	49.7
	600	Res	N	1298	60	1393	82.3						
Left Femur Moment	600	X	Nm	-82.2	40	75.9	84.1					-77.6	41.6
	600	Y	Nm	-25.6	49	-40.4	70.0					44.3	44.6
	600	Z	Nm	-30.1	62	25.6	143.6					-27.9	61.3
	600	Res	Nm	82.6	40	78.1	84					86.2	41.7
Pelvis	1000	X		18.9	59	-11.3	39.7	10.2	41	10.8	42.5	14.4	51.0
	1000	Y		50.2	42	79.2	42	80.4	38	82.1	39.4	67.2	42.5
	1000	Z		-6.6	18	-9.2	96	10.7	63	-24.8	45.5	-8.1	42.0